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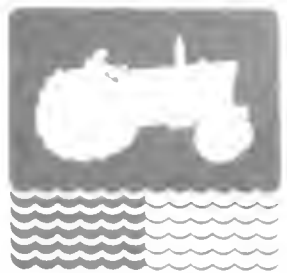
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"208" Update for Agriculture



AGRICULTURAL ISSUES RELATING TO STATE WATER QUALITY PLANNING

Vol. 1, No. 1

September, 1976

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James F. Frank, agriculture adviser to the IEPA, is chairman of the newly formed group.

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TASK FORCE MEMBERSHIP SET

The following is a list of members of the Task Force on Agriculture Non-Point Sources of Pollution, their organizational affiliations, and Task Force subcommittee membership. Each member of the larger Task Force also has membership on one of five subcommittees: pesticides (P), soil erosion (S), fertilizers (F), fruit produc-

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R. Thomas Heinhorst, Illinois Society of Professional Farm Managers and Rural Appraisers (F); Charles Hendricks, U.S. Department of Agriculture (FF); Philip J. Hermesen, Associated Milk Producers, Inc. (P); Juett C. Hogancamp, Illinois Department of

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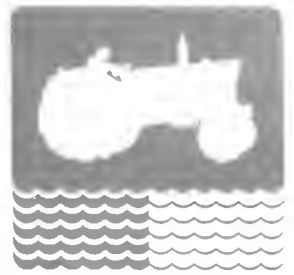
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James F. Frank, agriculture adviser to the IEPA, is chairman of the newly formed group.

The Task Force on Agriculture Non-Point Sources of Pollution has been appointed to advise the state EPA in producing a water pollution control plan for portions of the state in which comprehensive planning has not yet been started. This plan is required by federal legislation (Federal Water Pollution Control Act Amendments of 1972, Section 208) and is based on a U.S. District Court ruling in 1975. A statewide water quality management plan must be submitted to the governor and the federal EPA for approval by 1978.

Because agriculture may have a major impact on the water quality of lakes, rivers, and streams in the state, the special task force has been formed to study specific agricultural water pollution problems. Subcommittees to the larger agricultural task force will investigate and make recommendations about the control of pesticides, soil erosion, fertilizers, livestock waste, and forestry and fruit production.

CHARGE TO AG TASK FORCE

The Illinois Environmental Protection Agency has charged the Task Force on Agriculture Non-Point Sources of Pollution to: (1) assess the state's water quality problems as they relate to agriculture, and provide quantitative and qualitative descriptions of those problems and relationships; (2) evaluate alternative technical, institutional, and financial solutions to those problems; (3) identify problems involving agriculture for which an economically or socially acceptable solution cannot be found; (4) recommend a plan for solving agriculture related water quality problems; (5) and advise and assist the IEPA in the establishment of needed two-way communications between the agricultural community, other interests involved in water quality management, and water quality management decisionmakers.

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Wayne Archer, Illinois Farmers Union (F); George Arthur, Illinois Department of Conservation (P); Gerald M. Aubertin, S.I.U., Department of Forestry (FF, chairman); Robert G. Baker, Illinois Soil and Water Conservation Districts (S); Ronald Barganz, Illinois EPA (P); Joseph Berta, Illinois Department of Agriculture (S); Allison R. Brigham, Illinois Natural History Survey (P); Warren U. Brigham, Illinois Natural History Survey (F); Homer D. Buck, Illinois Natural History Survey (L); Phillip J. Challand, Illinois Bankers Association (P); Mike Conlin, Illinois Department of Conservation, Division of Fisheries (P); Albert Cross, Illinois Land Improvement Contractors Association (S); Harold Dodd, Illinois Farmers Union (P).

Lloyd Dolbeare, Illinois Association of Farmer Elected Committeemen (S); Earl F. Downen, F.S. Services, Inc. and Illinois Agriculture Association (F); Ronald Elliott, Illinois EPA (L); Jack A. Ellis, Illinois Department of Conservation, Division of Wildlife Resources (S); Conrad Erb, F.S. Services, Inc. and Illinois Agriculture Association (P); James F. Frank, Illinois EPA, chairman of the Ag Task Force; Gilbert Fricke, Illinois Agriculture Association (L); Dain Friend, Illinois Corn Growers Association (F); Leonard Gardner, Illinois Agriculture Association (L); Lyle Grace, Illinois Agriculture Association (F); Judith Groves, Illinois Environmental Council (P); John Gumm, Illinois Livestock Association (F); Warren E. Hadley, Illinois Livestock Association (P); Larry Hardin, Illinois Institute for Environmental Quality (S); Merv Harpster, Illinois Department of Agriculture (F).

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Agriculture (P); Russel Jeckel, Illinois Pork Producers (L); Joe H. Jones, S.I.U. (S); George Kapusta, S.I.U., School of Agriculture (P); Ross A. Kelly, Illinois State Horticultural Society (FF); John A. Killam, Illinois Livestock Association (L); Elmer King, Illinois Agriculture Association (P); Keith King, Associated Milk Producers, Inc. (L); Homer Kuder, Illinois EPA contractor (S); J.K. Leasure, S.I.U. (F, chairman); Dixon Lee, S.I.U. (L).

Malcolm P. Levin, Sangamon State University (P); William H. Luckmann, Illinois Natural History Survey (P, chairman); Michael McCreery, Illinois Agricultural Association (S); John McNeilly, Illinois Agricultural Stabilization and Conservation Service (S); Glen E. Massie, American Foresters Association (FF); Gary J. Meadows, Illinois Fertilizer and Chemical Association, Inc. (P); Sigurd W. Melsted, U.I., Department of Agronomy (F) (S); Al Mickelson, Illinois Department of Conservation, Division of Forestry (FF); T. Miller, Illinois Department of Conservation, Division of Fisheries (F); Roger C. Moe, U.S. Department of Agriculture, Soil Conservation Service (L); James B. Mowry, S.I.U. (FF); Morris E. Nelson, Illinois Agriculture Association (S); James R. Peterson, Metropolitan Sanitary District of Greater Chicago (F); Harold J. Poeschl, U.S. Department of Agriculture, Soil Conservation Service (S); John R. Raschke, Illinois Livestock Feeders Association (S); F.H. Rolf, Illinois Bankers Association (P).

Louise Rome, League of Women Voters of Illinois (L); Frank H. Schoone, U.S. Department of Agriculture, ASCS (S); Wesley D. Seitz, U.I., Department of Agricultural Economics and Institute for Environmental Studies (S); Jerry SESCO, S.I.U., Department of Forestry (FF); Richard E. Sparks, Illinois Natural History Survey (S); John B. Stall, Illinois State Water Survey (S); Jack A. Stewart, Illinois Fertilizer and Chemical Association, Inc. (F); A.G. Taylor, Illinois EPA (F); Al Tiemann, Illinois Agricultural Stabilization and Conservation Service (L); Dale Vanderholm, U.I., Department of Agricultural Engineering (L, chairman); Robert D. Walker, U.I. Cooperative Extension Service (S, chairman); George T. Weaver, S.I.U., Department of Forestry (FF).

WHAT IS "208" PLANNING?

The Federal Water Quality Act Amendments of 1972 (PL 92-500) is one of the most complex, comprehensive, and far reaching pieces of legislation ever to emerge from Congress. It establishes as a national goal the elimination of the discharge of pollutants into the nation's water by 1985. An interim water quality goal of "fishable, swimmable waters nationwide" is to be achieved by July 1, 1983.

Each state is required to establish a "continuing planning process" (CPP) for water quality management in order to achieve these goals. Programs that will ensure their achievement include setting statewide water quality goals and standards, awarding grants for design and construction of municipal sewage facilities, planning and constructing wastewater

treatment facilities, issuing permits for wastewater discharges to control point sources of pollution, enforcing the terms of these permits, evaluating effects of diffuse non-point sources of water pollution, and developing corrective programs.

Section 208

Section 208 of the Federal Water Quality Act deals with areawide waste treatment management. This section was originally interpreted by the Federal EPA as applying only to areas with particularly complex water pollution problems resulting from large urban populations and industrialization or other causes. State governors were required, therefore, to designate certain areas of each state and appoint representative organizations to develop effective areawide waste treatment management plans.

Under this interpretation of the law three areas and local planning agencies were designated in Illinois by Governor Dan Walker in the spring of 1975:

1. The East St. Louis Metropolitan area, composed of Madison, St. Clair, and Monroe Counties, with the Southwestern Illinois Metropolitan and Regional Planning Commission as the designated planning agency.

2. The ten-county area of southern Illinois where acid mine drainage and small town sewage disposal are the major water pollution problems. This is a joint planning effort by the Greater Egypt Regional Planning and Development Commission and the Southeastern Illinois Regional Planning and Development Commission, with the Greater Egypt Commission serving as the lead agency and grant recipient.

3. The six county Chicago metropolitan area with the Northeastern Illinois Planning Commission as the planning agency.

In June 1975, in the case of the Natural Resources Defense Council vs. Russell Train, a U.S. District Court ruled that planning of the type specified in Section 208 must be done in all areas, not just those designated by the governor and that the state government is responsible for conducting the planning.

This expanded 208 planning process will identify the sewage treatment works necessary to meet the anticipated municipal and industrial waste treatment needs over a 20-year period; establish construction priorities and time schedules for the initiation and completion of all treatment works; review regulatory programs and recommend possible revisions needed; identify those agencies necessary to construct, operate, and maintain all facilities required by the plan; identify the measures necessary to carry out the plan (including financing); and of particular concern to the Illinois Agriculture Task Force, identify all sources of non-point pollution and set forth procedures and methods to control, to the extent possible, such sources from agriculture, mining, and construction sites; control the disposition of all residual waste (sludge) generated that could affect water quality; and control the disposal of pollutants on land or in subsurface excavations to protect ground water and surface water.

The law further requires public participation in carrying out Section 208 planning activities.

Planning for Agriculture

To date, the major efforts to clean up the nation's water have been through the National Pollution Discharge Elimination System (NPDES) program. Under this portion of PL 92-500 discharge permits are required for all point source discharges. These include industrial plants, city sewage plants, and large agricultural feedlots.

Most agricultural pollution, which has not yet been clearly defined, comes from non-point sources such as runoff from fields where animal waste, fertilizers, and pesticides have been spread or where excessive soil erosion occurs. It was not until planning for the Section 208 program was started that agriculture was seriously affected by the water quality laws. Previously only larger livestock feedlots and pesticide use had been regulated. Section 208 plans that will be designed over the next two years will investigate and make recommendations for the control of all point, as well as non-point, sources of pollution.

STATE PLAN STRUCTURE FORMED

Following the U.S. District Court ruling in June 1975 that interpreted "208" water quality planning as a requirement for the whole state and not just those areas originally designated by the governor, the Illinois Environmental Protection Agency (IEPA) divided the non-designated portions of the state into six sub-areas for planning purposes. (See map.)

The SAAC's

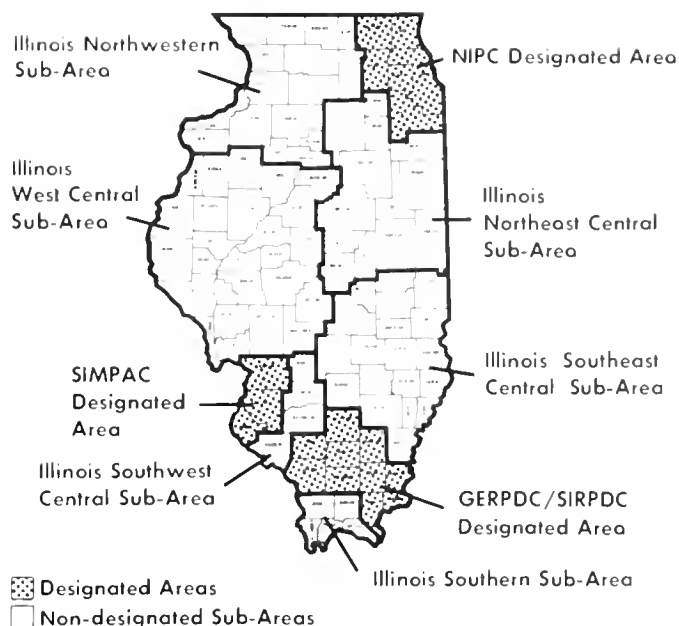
A Sub-Area Advisory Committee (SAAC) for each of the six sub-areas of the state and composed of citizen groups and planning commissions will advise the IEPA by making recommendations having a local or regional impact.

Water quality management plans, which will be incorporated into the total state plan, are already being designed for the three designated areas by the Southwestern Illinois Metropolitan and Regional Planning Commission for the East St. Louis metropolitan area, the Greater Egypt and the Southeastern Illinois Regional Planning and Development Commissions for a ten-county area of southern Illinois, and the Northwestern Illinois Planning Commission for the six-county Chicago metropolitan area.

The SPAC

A Statewide Policy Advisory Committee (SPAC) has also been formed which will consider policy alternatives and plan proposals to govern the entire state. This committee will work directly with both the Sub-Area Advisory Committees and with various technical advisory groups and task forces.

The SPAC will have representatives from state agencies with water quality responsibilities, the General Assembly, local government state organizations, certain federal agencies, and statewide public interest and environmental groups. Representatives from the three designated planning agencies will also participate as members of the committee.



SUB-AREAS CREATED. Non-designated portions of Illinois have been divided into six sub-areas for water quality planning purposes.

Water Quality Task Forces

A technical Advisory Committee will analyze and recommend certain water quality plans for their economic and social impact to the IEPA. An Urban Stormwater Task Force will oversee planning studies of water quality problems caused by urban stormwater runoff, and a Task Force on Agriculture Non-Point Sources of Pollution will develop recommendations for dealing with the water quality impacts of soil erosion and sediment transport, fertilizer usage and nutrient runoff, agricultural pesticides, livestock wastes, and forestry.

In addition to these advisory groups, focusing primarily on the non-designated areas of the state, advisory committees established by each of the designated planning agencies will also advise the IEPA.

The task forces and advisory bodies have been created simply to advise the state EPA. Ultimate authority for a state plan rests with the Governor, who has appointed the Illinois EPA as the agency responsible for developing the plan for his approval. The director of the IEPA retains the right to deviate from the recommendations of the task forces and advisory groups in developing a final statewide water quality management plan. After the plan receives the Governor's approval, it must be submitted to the U.S. EPA for federal approval before it is implemented.

In addition to the IEPA and its advisory groups, a large number of other governmental agencies have a role to play in development and implementation of the state's water quality management plan. Among the state agencies involved are the Institute for Environmental Quality, the Illinois State Water Survey, the Illinois Natural History Survey, the Illinois State Geological Survey, the University of Illinois, Southern Illinois University, the Departments of Agriculture,



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Conservation, Public Health, Local Government Affairs, Mines and Minerals, the Division of Water Resources in the Department of Transportation, and the Energy Division of the Department of Business and Economic Development.

A WORD OF INTRODUCTION

"208" Update for Agriculture is a newsletter published by the University of Illinois Cooperative Extension Service with supporting funds from the Illinois Institute for Environmental Quality. We will provide readers with information on the Illinois Environmental Protection Agency's (IEPA) planning activities for solving non-point sources of water pollution relating to agriculture in the state.

The IEPA has been designated as the state agency to develop a water quality management plan for all sections of Illinois not previously covered by 208 planning units. As part of the planning process, a Task Force on Agriculture Non-Point Sources of Pollution with five subcommittees has been appointed to study agricultural water pollution problems and to make recommendations to the IEPA.

A two-year period has been set for completing the state plan. While the plan will cover all water pollution problems, this newsletter will deal primarily with agricultural aspects.

Since the final plan is likely to recommend regulations to control identified pollution problems, it is important that Illinois agricultural leaders and others be kept informed of the Task Force on Agriculture Non-Point Sources of Pollution and its planning activities. Neither the Task Force nor the IEPA has the authority to make final regulations, but their recommendations will undoubtedly be considered by the Illinois Pollution Control Board when regulations are adopted.

Our purpose in publishing "208" Update is to keep you informed of the pollution problems identified

and the possible solutions being considered. If you feel that certain recommendations are impracticable, we urge you to contact your agricultural organization representative on the Task Force or to send me a letter which will be forwarded to the chairman of the Task Force or chairman of the appropriate subcommittee.

The initial mailing list to receive the newsletter includes over 2000 agricultural leaders and professionals employed in agriculture. As a general rule the letter will be mailed to the state officers and county presidents of the major farm organizations, commodity groups, and environmental groups. It will also be mailed to all agriculture county Extension advisers, SCS district conservationists, ASCS county executives, vocational agriculture teachers, FmB county supervisors, and the chairmen of the county agriculture Extension councils, county ASCS committees and Soil and Water Conservation District Boards. If you do not wish to receive this letter, please let me know and your name will be removed from the mailing list.

"208" Update will only be a part of the Illinois Cooperative Extension's educational program dealing with the state's water quality management plan. In addition, news releases will be sent out through county Extension offices and to newspapers as events unfold. Special public service programs will also be developed dealing with particular problems relating to agriculture and water quality.

The "208" planning process requires involvement of the public. Our objective is to provide you with the types of information that will enable you to become involved.

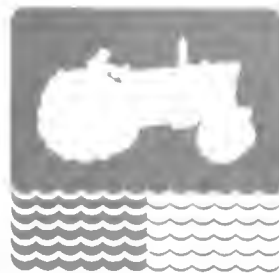
Robert D. Walker

Robert D. Walker
Extension specialist
Natural Resources



"208" Update for Agriculture

AGRICULTURAL ISSUES RELATING TO STATEWIDE WATER QUALITY PLANNING



Vol. 1, No. 2

October, 1976

SUBCOMMITTEE STUDIES EROSION

the first in a series describing the responsibilities of the five subcommittees to the Task Force on Agriculture Non-Point Sources of Pollution.)

It has been a state and national policy for over 40 years to control soil erosion. The Soil Conservation Service (SCS) was created in the 1930's to carry out a national soil erosion control program. Later, the State of Illinois passed the Soil and Water Conservation Districts Law in 1937 enabling groups to organize Soil and Water Conservation Districts, and local districts were organized covering almost all of the state's agricultural land by 1950. The SCS agreed to supply technically trained people to assist the districts in carrying on a soil conservation program on privately-owned land. The University of Illinois has conducted research on soil erosion and carried on educational programs, too, and the Agricultural Stabilization and Conservation Service (ASCS) has provided cost-sharing to farmers for installing soil conservation practices. The major objective of these voluntary programs was and continues to be to conserve the topsoil so that crop production can be maintained for future generations.

New Thrust

The environmental concerns of recent years have given a new thrust to soil conservation programs and to soil erosion control: controlling soil erosion to prevent water pollution. A new group of agencies have been formed to see that the quality of the environment is maintained or improved, too.

The Federal Water Pollution Control Act Amendments of 1972 has the objective "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." Section 208 of this same law of particular interest to farmers because it deals with non-point (runoff) sources of pollution from agriculture and forest lands.

Runoff Control?

In Illinois the Soil Erosion Subcommittee to the Task Force on Agriculture Non-Point Sources of Pollution is now assessing the soil erosion and sedimentation problem as it relates to water quality in the state. Specifically, it is investigating the physical, chemical and biological effects of sediment on Illi-

nois waters. Subcommittee chairman Bob Walker poses several questions that must be addressed by his committee:

Is agricultural land a significant non-point source of pollutants to streams, lakes, and reservoirs? If soil particles are pollutants or pollutant carriers, then the answer is clearly yes for most of Illinois. Several interesting issues, however, emerge whether runoff control is the best answer. First, soil erosion is a natural process. Even if stringent runoff programs were applied to Illinois farmlands many of our streams will still carry muddy water much of the time. Second, water quality authorities suggest that some of the more complex pollutants are attached to the soil particles and are more easily removed when silt laden water is treated for domestic use. Third, much of the soil eroding from one area of a field will be deposited in another area without getting into a defined water course. Only 20 to 30 percent of the soil that erodes from an area will get into state waterways.

Region	Suspended sediment concentration*	Dissolved solids concentration**
----- m g / liter -----		
New England	< 300	< 100 - 300
Southeast	< 300 - 2,000	< 100
Central Corn Belt	300 - 5,000+	300 - 700
Lake States	< 300	< 100 - 700
Great Plains	300 - 30,000	300 - 2,600
Southwest	2,000 - 50,000	300 - 2,600
Pacific Northwest	< 300	< 100 - 300

*Average annual discharge - weighted means; sediment concentration =
Annual flow
Annual stream flow

**Modal dissolved - solids concentrations.

SEDIMENTATION DATA. River basins in different regions of the United States have widely varying concentrations of suspended sediments and dissolved solids. This table was taken from "Sediment-Water Interactions," W.R. Oschwald, *Journal of Environmental Quality*, Vol. 1, No. 4, 1972.

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Water Quality and Soil Conservation

A second major question and one that is perhaps more difficult to answer is:

What would be the effect on the quality of water in our streams and lakes if recommended soil conservation practices were installed on the entire watershed?

The answer to this question is not clear. Some engineers suggest that scouring of the stream banks and bed would bring the sediment load up to a given level even with the adoption of a good soil erosion control program on the watershed. Sediment can carry large amounts of plant nutrients into our streams and lakes, but many of these nutrients are firmly attached to the soil particles and may not necessarily increase the nutrient level in the body of water.

Adoption of Soil Practices

A third major question:

If effective soil erosion control practices for abatement of non-point sources of pollutants are identified, what mechanism would bring about the adoption of these practices on land to reduce water pollution from soil erosion?

Our past soil conservation programs have generally consisted of two approaches: education and economic incentives.

The Colleges of Agriculture and Extension Services of the U.S., working with the local Soil and Water Conservation Districts and the Soil Conservation Service have provided education and information to bring about voluntary action to improve farming practices to reduce soil erosion. An accelerated, publicly-financed educational program could bring about more changes in the future.

Many landowners have installed soil conservation practices with ASCS cost-sharing programs when they would not have done so without this assistance. Again, improved cost-sharing programs could help bring about a faster adoption of pollution control practices. A third method of bringing about adoption, which farmers have generally not approved, are laws and regulations. The present environmental laws clearly give the administering agencies the authority, however, to require practices to control water pollution, providing the practices can be identified and can be economically installed on the land.

There are other methods that could be used as incentives to get faster adoption of pollution control practices such as tax breaks or public ownership of land. The answer will probably be the least objectionable combination of these methods.

While the objective of our past soil erosion control programs has been to protect the soil productivity to provide food for future generations, now Environmental Protection Agencies are charged with the responsibility of controlling soil erosion so future generations will have an adequate supply of good quality water.

As long as the same practices can be used to meet both objectives there is no problem. Muddy water must not be assumed to be absolute evidence of serious field erosion. On the other hand, the farmer

has as much or perhaps more to gain if our streams are unpolluted.

EPA GIVES WATER QUALITY INFO

Human and animal wastes are the most frequent polluters of Illinois waters, according to Tom Wallin, water quality planning unit supervisor, Illinois Environmental Protection Agency (IEPA), Springfield.

In remarks to representatives of the Task Force on Agriculture Non-Point Sources of Pollution meeting in Urbana recently, Wallin described the results of the 1976 water quality inventory completed by the IEPA.

More than 98 percent of the 588 water quality sampling stations statewide reported in 1975 at least one violation of the acceptable level of 400 fecal coliforms per 100 ml (milliliters) of water. Fecal coliforms are bacteria found in the digestive tracks of warm-blooded animals.

Improper treatment of human wastes and animal feedlot runoff are the most common reasons for exceeding this fecal coliform level. An excessive level indicates that pollution may be a problem in the sampled water.

Total iron, ammonia nitrogen, copper, dissolved oxygen, lead, manganese, and total phosphorus were also found at levels violating state water quality standards at many of the sampling stations, according to Wallin. Illinois water quality standards are among the most stringent in the nation.

The IEPA has developed an index to measure the water quality of the 11 major river basins in Illinois considering the levels of many of the heavy elements or metals, minerals, solids, and other materials commonly found in the waters. Data from the sampling stations for 1971 through 1975 have been used to predict statewide water quality trends.

For 538 sampling stations where comparable data for 1972 and 1975 were available, conditions as measured by the water quality index improved at 93 stations and deteriorated at 50 stations. No significant change occurred at 379 stations. Upgrading sewage treatment facilities, which handle sanitary sewage from municipalities, was the reason for most of the improvement.

WATER USES REEXAMINED

A one-year research project has been funded by the Illinois Institute for Environmental Quality to study Illinois streams and rivers, determine their present and possible future uses, describe the water quality standards that will support these uses, and estimate the cost of imposing the standards, according to Dor Wilkin, assistant professor, U.I. Department of Landscape Architecture.

Wilkin and Ben Ewing, director of the U.I. Institute for Environmental Studies, are co-principal investigators of the project which began in July. The objective of the research is to design a program which can be used on any body of water to determine uses and water quality standards, as well as costs for making the water meet particular use standards.

The study is being conducted initially on the upper Sangamon. It is also anticipated that work will be done on the DuPage, on a reservoir, and on a body of water that is near a stripmine area. These bodies of water represent most of the critical water quality problems that Illinois is facing today.

The research will ultimately enable the Illinois Pollution Control Board to make more effective decisions about water quality regulations for the state.

EROSION MODELING UNDERWAY

Determining how soil erosion and plant nutrients, two major non-point sources of pollution, can be controlled in Illinois is the basis of a research project at the University of Illinois Institute for Environmental Studies funded by the Institute for Environmental Quality, Springfield, according to Wesley D. Reitz, project leader and member of the Ag Task Force.

The analysis will be made using a computer model, one of the largest and most detailed models of crop production that has ever been constructed. The model was originally developed to analyze crop production for the whole corn belt, but it will be modified for state use as part of the current research effort.

The model will analyze the impact of imposing a number of controls on production, including (1) cross soil loss restrictions, (2) terrace subsidies, (3) taxes on soil loss, (4) bans on fall plowing or straight row cultivation, (5) restrictions on the amount of nitrogen fertilizer applied, (6) nitrogen fertilizer controls, and (7) combinations of any of these controls. The model can use any of these planned set of controls and provide estimates of the impact of the controls on crop acreages, crop prices, consumer prices, farm income, soil loss, fertilizer use, and pesticide use.

The model could be an important tool in describing the impact on the agricultural sector should certain restrictions be placed upon production to comply with future state water quality goals. The Ag Task Force will use the model to determine if proposed practices would be economically reasonable.

STATE WATERS HURT FISH

All fee fishing areas in Illinois are in the process of being tested by the Illinois Department of Conservation for contaminants absorbed by fish, according to Mike Conlin, chief, Division of Fisheries, Department of Conservation.

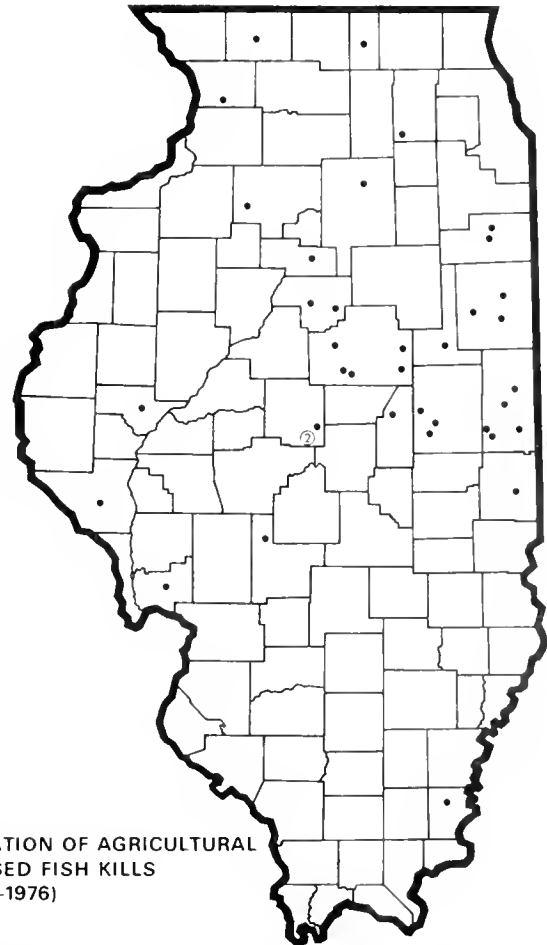
As of August 1976 laboratory results on 77 such areas showed that 50 percent contain contaminated fish, Conlin reported to a recent Ag Task Force meeting.

Since July 1975 the Conservation Department in cooperation with the Illinois Department of Public Health and the Food and Drug Administration has been testing popular fee fishing spots for the presence of PCB's, dieldrin, DDT, and mercury.

The department is also monitoring fish in state-owned lakes, public lakes, federal reservoirs, rivers, and streams.

The pesticide, dieldrin, has been found in particularly high levels in recent years in fishes in the Illinois, Mississippi, Kaskaskia, and Ohio Rivers. Monitoring of fish in the Illinois, Mississippi, Spoon, Rock, Pecos, Little Wabash, and Fox is also continuing.

Of the 259 documented fish kills in Illinois between 1962 and September of this year, 39 have been attributed to agricultural pollution, 86 to industrial pollution, and 38 to municipal pollution. Over 10 million fish were killed at a loss of approximately \$600,000.



• LOCATION OF AGRICULTURAL
CAUSED FISH KILLS
(1962-1976)

AGRICULTURAL FISH KILLS. Of the 259 documented fish kills in Illinois between 1962 and September of this year, 39 have been attributed to agricultural pollution from poison, fertilizer, and animal wastes.

SAMPLING TECHNIQUES TELL WQ

It is generally impossible to characterize Illinois stream quality as totally good or bad, according to Ron Barganz, Illinois EPA engineer in the Division of Water Pollution Control, speaking at the September meeting of the Ag Task Force. Stream quality in most basins consists of a series of good and bad areas depending on the location of polluting dischargers.

Common dischargers include municipalities, industries, farms, schools, and septic tanks. The Illinois EPA has also been attempting to locate unknown dis-



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charges and to assess the impact of various land use practices such as farming methods, urban areas, highways, and highway construction on water quality, Barganz said.

People have underrated the value of streambed analysis and the biological information it provides as a method of determining water quality, he said. This kind of analysis is a valuable indicator of the cultural activities taking place along a body of water and the kinds of discharges going into the water.

Fish Sampling

One technique for measuring water quality in a stream or lake is fish sampling. Some fish such as largemouth bass and crappie are generally considered "top of the food chain" predators, Barganz said.

Being dependent on lower forms of aquatic life for their existence, the health of the fish, to some extent, reflects the health of the entire aquatic system. Some toxic chemicals absorbed by certain water insects and bottom life may accumulate to their greatest extent in these predators. Thus, any detrimental effects are most likely to appear in the fish first.

PCB's (polychlorinated biphenyls) are by-products of the electronics industry, dieldrin (a common pesticide), and mercury are generally the most persistent chemicals historically used in Illinois that can accumulate to excessive levels in the food chain. The Illinois EPA is shifting emphasis in this program and will be measuring concentrations of the more commonly used herbicides and insecticides in fish tissue, too.

Sediment Sampling

Another water quality sampling technique is sampling the sediment in a river, lake, or stream. Sediment analyses provide an inexpensive surveillance tool, Barganz said, that when taken downstream from an area of concern can provide useful information about the toxic materials discharged into the water.

Testing for metals in sediment such as cadmium, zinc, copper, and others, the EPA has found that

urban areas contribute these materials much more heavily than rural areas in the state, Barganz said. Some metals enter the food chain, accumulate in fish, and can accumulate in man, too, he said.

EMERGENCY HOTLINES

There are two emergency numbers that can be used to report discharges or spills of hazardous materials in Illinois.

The Emergency Action Center in Springfield is operated on a 24-hour basis by the Illinois EPA. Call 217-782-3637 with the following information: (1) describe the material being discharged, (2) give the location, (3) estimate the direction of the flow if the material is discharging into a body of water, and (4) describe who, if anyone, is on the scene attempting to solve the problem.

The U.S. Coast Guard also runs a water pollution hotline. By calling a toll-free number, 800-424-8805, you can report discharges into any of the nation's navigable waters. The hotline is staffed by Coast Guard officers who are members of the Marine Environmental Protection Division, and it is also run 24 hours a day.

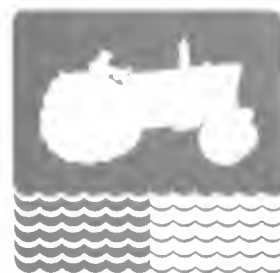
Robert D Walker

Robert D. Walker
Extension specialist
Natural Resources



"208" Update for Agriculture

AGRICULTURAL ISSUES RELATING TO STATEWIDE WATER QUALITY PLANNING



Vol. 1, No. 3

November, 1976

STATE'S HIGH NITRATE WATER ID'D

Nine surface water supplies and nine well supplies, which usually have high nitrate levels sometime during the year, are being monitored in the state, according to Dorothy Bennett, Illinois EPA, Public Water Supplies Division, speaking to a recent Ag Task Force Fertilizer Subcommittee meeting. (See state map for location of high nitrate supplies.)

State W.Q. Standard

The problem, especially with surface water treatment plants, however, is the relatively short portion of the year when levels are above the state standard, she said.

Some years these levels (standard for nitrogen in drinking water is 10 mg/l) are not reached at all, Bennett said. Asking these water treatment plants to install expensive equipment to control for nitrate content would present an economic burden which would be hard to justify, she said.

High nitrates in well water supplies, however, usually continue throughout the year and removal could be justified, if economically feasible, since the plant equipment would be used continuously, Bennett said.

High nitrates in water are, primarily, a hazard to infants who can suffer from nitrite poisoning ("blue baby" disease). The digestive tract of infants is not acid enough to prevent the conversion of nitrates to nitrites, and nitrites reduce the oxygen-carrying capacity of blood. A baby, literally, can suffocate.

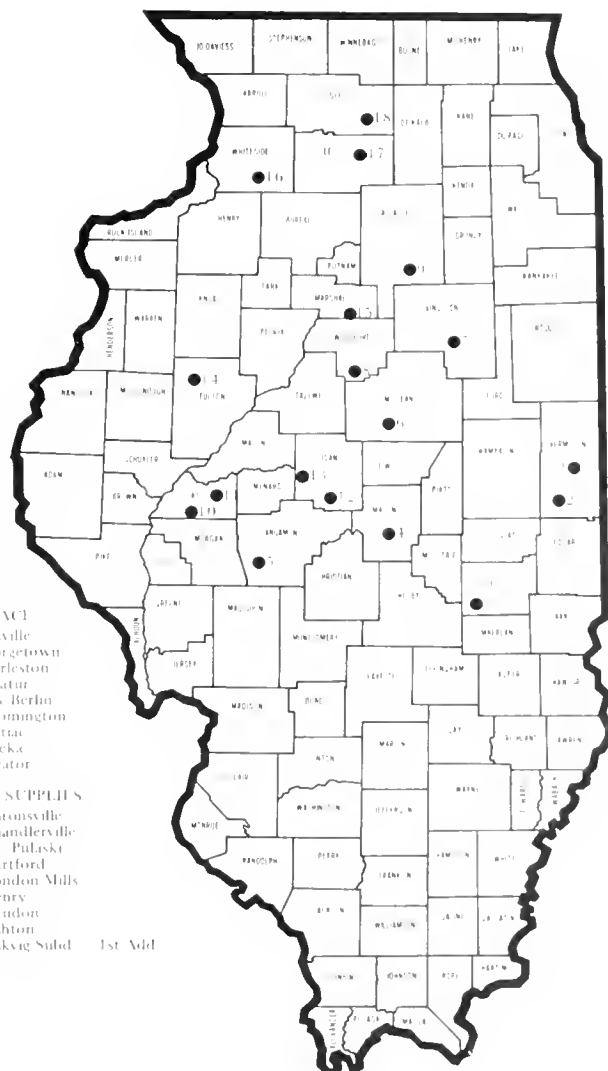
Water Sampling

The monitoring network set up by the Division of Public Water Supplies in Springfield samples all public ground water supplies every two years and all surface waters every month in order to identify any high nitrate water supplies in the state.

Through this sampling operation, the nine surface and nine well supplies that had high nitrate concentrations were identified. Samples of their water are analyzed by the Public Water Supplies Division every week, Bennett said.

Communities having water supplies with rising nitrate levels have established a notification system through local newspapers and radio to alert susceptible populations, like infants and expectant mothers.

(continued next page)



SURFACE

- 1 Danville
- 2 Georgetown
- 3 Charleston
- 4 Decatur
- 5 New Berlin
- 6 Bloomington
- 7 Pontiac
- 8 Lureka
- 9 Streator

WELL SUPPLIES

- 10 Aaronville
- 11 Chandlerville
- 12 Mt. Pulaski
- 13 Hartford
- 14 London Mills
- 15 Henry
- 16 Lyndon
- 17 Ashton
- 18 Askeg Subd. 1st Add

PUBLIC WATER SUPPLIES WITH HIGH NITRATE LEVELS. The IEPA Division of Public Water Supplies routinely samples 18 public water supplies for high nitrate levels. They lie primarily in the eastern and central part of Illinois and serve a combined population of about 209,000 people.

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when necessary. Bennett believed this is keeping the problem under control.

Nitrates enter surface waters through domestic sewage discharges, field runoff, and livestock wastes. Some change in timing and rate of fertilizer application, removal of nitrates at the sewage plant, or improved livestock waste handling systems are a few ways to reduce nitrogen in these waters.

PESTICIDES SUBCOMMITTEE SUPPORTS SURVEY

(The second in a series describing the work of the five subcommittees to the Task Force on Agriculture Non-Point Sources of Pollution.)

The Ag Task Force's Subcommittee on Pesticides is supporting a pesticides usage survey to be distributed among a sample of Illinois farmers in early December.

The survey is being done by the Illinois Crop Reporting Service in cooperation with the USDA, the Illinois Department of Agriculture, and the Division of Energy of the Illinois Department of Business and Economic Development.

According to William H. Luckmann, head of Economic Entomology for the Illinois Natural History Survey and head of Ag Extension Entomology, U.I. College of Agriculture, this is the first time since 1972 that the survey has been done by the Crop Reporting Service.

HEQ Funds Survey

Funding for the pesticides survey will come from the Illinois Institute for Environmental Quality (HEQ) at the request of the Pesticides Subcommittee, according to Luckmann, subcommittee chairman. The survey will gather information about the number of acres in the state treated with pesticides, the kinds of pesticides used, the timing of applications, the rates and methods of application, and the disposal of pesticide containers.

According to Luckmann, the question on the survey about container disposal is one of the most critical to be investigated by his subcommittee. Data from the survey will help to describe the magnitude of the problem in the state.

Luckmann estimated that approximately 20-25 million pounds of pesticides, primarily herbicides, fungicides, and insecticides, are applied to Illinois farmland annually. Most pesticides come in five-gallon containers, easily handled by an individual farmer. The problem of disposing of all these containers without environmental damage, Luckmann said, is great.

We are satisfied by the amount of data already published on soil erosion and sedimentation that soil movement is the way most pesticides get into our stream systems, Luckmann said.

Container Disposal Creates Problem

Now we must turn our attention to a new area of concern: the disposal of containers. We don't know the extent of non-point pollution this is causing, he said. Economic incentives may have to be created to

get farmers to return their containers to a central disposal site; perhaps by charging a deposit fee on each container.

We need more data, though, about how farmers have been handling this problem in the past, and the pesticides survey may be a good way to start collecting it, Luckmann said. Disposing of waste products from commercial spray operations, like the rinse water used to wash out applying machinery, is a problem, too.

SUBCOMMITTEES RECEIVE CHARGE

The Task Force on Agriculture Non-Point Sources of Pollution, with approximately 70 members representing various state, agriculture, and environmental groups, has been organized to advise the Illinois EPA on water pollution related to agriculture. The Ag Task Force has been divided into five subcommittees in order to investigate major problem areas: fertilizers, pesticides, livestock waste, soil erosion, and forestry and fruit production. These subcommittees recently received their charge from the state EPA.

According to Jim Frank, agriculture adviser, Illinois EPA and Ag Task Force chairman, the charges or objectives were developed to answer EPA questions.

Since the task of the subcommittees is to provide advisory reports to the Illinois EPA for inclusion in the state water quality plan, we hope that the subcommittees will consider all of their charges and deal with them in some way, Frank said.

"They may decide that some of the charges are not important or do not constitute water quality problems: this is what we need to know," he said.

The following is a summary of the charges by subcommittee. (The forestry and fruit production area is being investigated by a special Illinois EPA-funded project to the School of Agriculture, Southern Illinois University.)

Fertilizer Subcommittee

The charges to the Fertilizer Subcommittee are to assess the state's water quality problems related to fertilizer use; recommend the best management practices to control water pollution from fertilizer use, municipal sludge application, and fertilizer storage; and recommend the best method of getting the recommended practices implemented.

To carry out these charges the subcommittee has been asked to study fertilizer use by county and to determine, if possible, the relationship between fertilizer use and municipal high nitrate water supplies.

In addition, the subcommittee is to study the relationship between the forms of phosphorus present in state waters and eutrophication of selected lakes. This will help to determine what soil erosion limits are needed to prevent nuisance eutrophication conditions.

Pesticides Subcommittee

The Pesticides Subcommittee has been asked to determine present pesticide problems, recommend programs for solving these problems, and suggest methods of implementation. In carrying out their

ask the subcommittee will be surveying farmers to obtain current information about existing problems. They will also study pesticide use and its relationship to soil erosion, as well as to consider how some pesticides get into fish.

Pesticide container recycling or disposal will also be researched by the subcommittee.

Livestock Waste Subcommittee

The Subcommittee on Livestock Waste will determine the water quality effects of (1) spreading manure on cropland, hayland, and snow-covered land, (2) various stocking rates on pasture, and (3) allowing livestock to have direct access to streams.

The subcommittee will also evaluate various feedlot runoff control systems, such as vegetative filter strips, as methods for preventing water pollution. They plan to evaluate current federal feedlot regulations, proposed state regulations, and EPA guidelines on field application of livestock waste.

Soil Erosion Subcommittee

The Soil Erosion Subcommittee will describe soil erosion problems and recommend practical soil erosion control programs that will maintain or improve the state's water quality.

To accomplish this task the subcommittee will analyze the sediment effects on water for municipal, recreational, agricultural, and industrial uses, as well as the effects on aquatic life. In addition the subcommittee is to conceive and evaluate alternative technical, institutional, and financial solutions to Illinois' problems, estimate what these programs will cost, and how they might be financed.

Task Force Schedule

A schedule of twenty, monthly, one-day task force meetings has been planned in order to accomplish this advisory task. General meetings will be held in the mornings, with subcommittees meeting in the afternoons. The first nine months (July, 1976 — March, 1977) will be devoted to determining water quality problems, their location, and how serious the problems are as they relate to agriculture. Speakers with environmental concerns and problems have been scheduled to speak to the entire task force. Each subcommittee will review literature and available statistics, relating to their particular area, as well as confer with EPA staff and researchers.

During the next five months (April, 1977 — August, 1977) the subcommittees will attempt to determine how much reduction of agricultural pollution is needed, the best programs for achieving this reduction, and the cost of achieving such a reduction in each of their areas.

Final Plan

A plan for solving agricultural-related water quality problems will be designed in the final months of the study. This plan will outline the different methods or "best management practices" that might be used to reduce the problems, as well as the legal, financial, and institutional mechanisms through which the practices might be implemented.

The end product of the Ag Task Force will be a report, submitted to the Illinois EPA in January, 1978, identifying the state's water quality problems related to agriculture, a recommended plan for solving those problems, and an identification of those problems for which the task force could not find economically or socially acceptable solutions.

An equally important function of the task force is to report to the public those areas for which sufficient data could not be found to support charges of agricultural pollution.

* * * * *

Earl R. Swanson, professor, U.I. Department of Agricultural Economics, will discuss "The Economic Analysis of Soil Loss from Illinois Farms" at the November 29 general meeting of the Ag Task Force. There will be no December meeting; however, the Task Force will meet twice in January: January 4 and 31.

SIMAPC PLANNING UNDERWAY

Individual water quality plans, like conservation planning introduced by the Soil Conservation Service more than 30 years ago, may be the answer to non-point pollution, according to Harry Allen, Southwestern Illinois Metropolitan and Regional Planning Commission (SIMAPC) who spoke at a recent Ag Task Force meeting.

SIMAPC is one of three designated planning commissions in the state who have been working on water quality plans since March 1975. Northern Illinois Planning Commission and Greater Egypt Regional Planning and Development Commission are also involved in producing water quality plans for their regions in order to fulfill the requirements of Section 208, PL 92-500, the Water Quality Act Amendments of 1972.

Ag Advisory Committee

In order to assess agricultural sources of pollution, Allen said, he organized an agriculture technical advisory committee for his region, including district conservationists, Soil Conservation Service; county Cooperative Extension Service advisers; the director of the Southern Illinois University Experiment Station at Belleville; and representatives of various ag-related industries.

Finding out where the major livestock concentrations are in the region, and determining loading rates in streams are some of the major problems SIMAPC has faced in studying agricultural-related water quality problems. It is also particularly hard, Allen said, to sample water during times of "first flush" when rains or melts produce the greatest evidence of non-point sources.

Lack of Data

Assessing the magnitude of non-point source pollution, Allen concluded, was difficult because there is a lack of data. He was critical of farm census data, saying it was always two or three years out of date when it is published.

(continued next page)



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Besides looking at agricultural pollution, SIMAPC is preparing staff papers on municipal dischargers, industrial dischargers, on-site sewage disposal (septic tanks), wastewater treatment plant residuals (sludge), urban stormwater runoff, and mining.

SLUDGE WORKSHOP HELD

A three-day conference, "Land Application of Sewage Sludge and Wastewater," was held in Champaign, October 18-20, sponsored by the University of Illinois, the Illinois EPA, and the Illinois Institute for Environmental Quality (IEQ), according to Dale H. Vanderholm, conference chairman and Ag Task Force member.

The conference was designed to acquaint consulting engineers, sanitary district personnel, agriculturalists, and interested citizens with utilization techniques for sludge and wastewater.

Sludge Regulations

Principal speakers included Mike Mauzy, Illinois EPA, who discussed current regulations governing the application of sludge and wastewater; in particular, the need to modify Illinois H.B. 1198.

The role sludge can play in crop production and soil maintenance was discussed by two U.I. agronomy professors, John J. Hassett and Joseph A. Jackobs. Specific problems that engineers designing treatment plants are facing were also described.

In addition to Vanderholm, other Ag Task Force members, who participated as speakers at the conference, were Mike McCreery, Illinois Agricultural Association, who described the findings of the Illinois EPA Advisory Committee on Sludge and reactions of farmers to sludge application, and Jim Frank, Illinois EPA, who described application methods.

Significant Changes

Wesley D. Seitz, associate director of the U.I. Institute for Environmental Studies and Ag Task Force member, summarized the conference. He said that significant changes are now occurring in the use and application of sludge.

The regulatory system for sludge and wastewater application is being debated and modified, he said. The current approach, however, is to design a sludge utilization-disposal system, rather than selling the sludge itself to farmers, Seitz said.

He said that if farmers viewed the sludge as an important source of plant nutrients and organic materials, and if they could purchase it through established farm supply outlets, like co-ops, sludge use might be much more successful.

Describing sludge application to cropland as a solution to an urban waste disposal problem, on the other hand, is not an effective message, Seitz said.

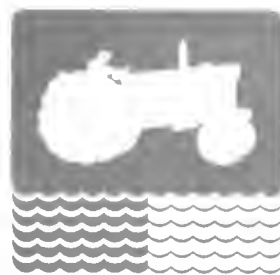
Robert D. Walker

Robert D. Walker
Extension specialist
Natural Resources



"208" Update for Agriculture

AGRICULTURAL ISSUES RELATING TO STATEWIDE WATER QUALITY PLANNING



Vol. 1, No. 4

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BMP System Described at Non-Point Conference

"There is no way that a federal agency or even a state agency will be able to have an effective non-point pollution control program without involving the local soil and water conservation districts," said James E. Lake, Allen County, Indiana conservationist, discussing best management practices at a U.S. EPA-Region V sponsored seminar on non-point pollution in Chicago, November 16 and 17.

Lake, project leader of a U.S. EPA-funded project, "Environmental Impact of Land Use on Water Quality: The Black Creek Study," said that a soil erosion program employing best management practices will only be successful when emphasis is placed on "the grass roots contact and understanding that the local soil and water conservation districts have with their agricultural landowners."

Testing BMP's

The Black Creek study, which is attempting to determine the role that agricultural pollutants play in water quality degradation, is in its fifth year of activity. Lake discussed the BMP's (best management practices) which have been tested in the Indiana watershed and found effective.

Lake said that project results indicate, of 31 conservation practices studied, there are approximately 10 that can be recommended as BMP's. The first is conservation tillage which leaves crop residue on the surface to reduce soil erosion.

The second is parallel tile outlet terraces, which would also require a conservation cropping system (crop rotation), tile drainage, and contour farming. Some farmland needs to be removed permanently from crop production and placed in permanent pasture: pasture and hayland planting is a third BMP. Animal waste holding tanks and ponds to control runoff is a fourth practice that can be recommended. In addition, grade stabilization structures, grass waterways, and sediment control basins, if needed, are important. Finally, there are certain recommended BMP's related

to stream conservation: streambank protection, stream channel stabilization, and field border establishment.

Emphasizing Public Benefit

Lake said that in evaluating cost sharing for best management practices, the philosophy of public dollars for public benefit must be emphasized.

"We have to concentrate on those practices which are necessary for erosion control and improved water quality. We also have to consider those practices which are permanent, so that the public can be assured that the practices will remain on the land for a long period of time, even when land ownership changes. Ideally, practices that meet these requirements can be called best management practices," he said.

If a BMP is required for erosion control and improved water quality, Lake said, but reduces economic return and production for the landowner, it must be recognized that the farmer should be compensated for lost revenue and lost production through financial incentives.

Disposal Research Approved

The Pesticides Subcommittee of the Ag Task Force approved two research projects November 29, designed to investigate statewide container disposal and disposal of diluted rinse solutions from custom spray equipment.

Those members of the subcommittee present voted unanimously to support the research as partial fulfillment of the subcommittee's charge to investigate pesticides and statewide water quality. A. G. Taylor and Jim Frank, Illinois EPA, described the proposed research.

The IEPA will finalize the proposals and submit them for possible funding through the Illinois Institute for Environmental Quality (IEQ), the U.S. EPA Pesticides Office, other special "208" water quality programs, or a combination of the three sources.

Over one million pesticide containers are emptied annually in Illinois. These containers pose a large disposal problem, since they often contain chemical residues potentially hazardous to human and animal life.

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The proposed research on nonpoint disposal will include a study of the feasibility of collecting and recycling containers. The most cost efficient, as well as safe, method for collection and processing cans for resale will be determined, including the costs of equipment, storage, transportation and labor.

Finally, a pilot demonstration of the proposed procedure will be conducted. A private firm will be sought to manage the operation in a predominately agricultural part of the state. After one year the disposal process will be assessed to determine if it is applicable statewide.

The rinse solutions from custom spray equipment pose a comparable disposal problem; only the quantities are larger and disposal sites become more concentrated than for an individual farmer. Researchers would design a system for disposing dilute rinseate solutions, operate it, and determine which chemicals can be handled safely by this disposal method and which can not.

Ecology of Running Water: Pollution Indicator

The cumulative effect from upstream nonpoint sources of pollution, like urban runoff, soil erosion, or small feedlot operations, is a predominant contributor to pollution downstream, according to Allison R. Brigham, aquatic biologist with the Illinois Natural History Survey and Ag Task Force member.

Stream Size

Physically, running waters cluster into three major categories based upon stream order: small headwater streams, medium-sized rivers, and large rivers. Each supports a particular kind of aquatic community, too, Brigham said.

The small streams, or feeder streams, are very closely tied to activities on the land. In the small streams coarse particulate organic matter in the form, primarily, of fallen leaves and other vegetation is digested by a group of aquatic invertebrates commonly called "shredders." The shredders become less important further downstream where "collectors" predominate, feeding on the fine particulates produced by the shredders. And fish, she said, feed on these invertebrates.

Aquatic life can usually withstand many pollutants, Brigham said. When they become excessive, however, they reduce the variety of organisms living in the water. Naturally unpolluted systems, on the other hand, have a diversity of living things, she said.

Pollution Tolerances

Aquatic animals have pollution tolerances from the very tolerant, like the fathead minnow, to members of the very sensitive group, like the mayfly or stonefly. According to Illinois EPA studies of streams in the state, most are in an unbalanced or semipolluted state. An

unbalanced stream contains more than 10 percent but less than 50 percent intolerant or water sensitive invertebrates. Semipolluted waters contain less than 10 percent intolerant species. A balanced system would contain greater than 50 percent intolerant species, and a totally polluted stream would contain 100 percent tolerant invertebrates, according to Brigham.

The concept of stream succession from the headwaters to the mouth is an important consideration, especially in terms of "fishable" streams and improving water quality.

Stream Succession

James R. Karr, associate professor, U.I. School of Life Sciences, illustrated this idea of stream succession in his report on the Black Creek, Indiana sedimentation study funded by the federal EPA:

"The fishes and aquatic life of our smaller streams and headwaters are part of a complex food chain which 'feeds' the biotic system of the rivers. Failure to maintain the biotic system of the small streams above the river will inevitably result in the loss of fishery in the main river.

"We can compare the small streams of the main river to the leaves of a corn plant. If the leaves, which feed the corn plant are diseased, the corn plant will not be healthy and may even die."

Study Completed on Erosion, Farm Income

The very slight effect on net farm income from erosion in five Illinois watersheds makes certain conservation practices less attractive to farmers, Earl R. Swanson, U.I. Department of Agricultural Economics, said at a recent Ag Task Force meeting.

"Perhaps the biggest obstacle to implementing a change in farming practices is that the benefits from the reduction in erosion do not accrue to the farmer making the change but to others, while the cost of the change in the form of reduced private net income is incurred by the farmer," Swanson, project leader of the 1972 economic analysis of soil loss from Illinois farms, said.

Analysis Objectives

The research, funded by the Illinois Institute for Environmental Quality (IIEQ), had three objectives: (1) to estimate the loss of productivity and net farm income due to erosion, (2) to estimate the sedimentation damages caused by agriculturally-related soil erosion, and (3) to evaluate various incentive systems designed to encourage farmers to adopt certain farming practices.

Researchers concluded that (1) erosion had a very slight effect on net farm income for five of the six watersheds studied, (2) sediment damage was much

greater than productivity loss, and (3) social loss (the sum of productivity loss and sediment damage) was not great enough in most cases to encourage farmers to adopt different farming practices.

Farming Alternatives

Six watersheds were analyzed during the study: the Mendota and the North Fork of the Embarrass, both high income areas; Crab Orchard and Seven-Mile Creek, both lower income; Lake Glendale, highly forested; and the Hambaugh-Martin, with serious erosion problems. Farming alternatives analyzed for each watershed included combinations of three variables: cropping sequence, tillage system, and conservation practices. The combinations, in turn, affect the immediate income of the farmer and create soil losses which affect long-term crop yields and can produce sediment damage.

The study was based on a twenty-year planning period, and for all watersheds except Hambaugh-Martin, the reduction in private net income from erosion using any of the farming combinations was generally less than one dollar per acre. A two-dollar income reduction occasionally occurred when conventional tillage and up-and-down cultivation were used.

The research also showed that watersheds must be analyzed on "a case-by-case" basis, Swanson concluded, since each reflects its farming operations in a very individualistic way.

Pesticides Monitored in Water

Levels of commonly-used pesticides are considerably below the maximum allowable limits in Illinois' surface public water supplies, said Dorothy Bennett and John Hurley, Illinois EPA.

The state EPA has been routinely sampling and analyzing 139 surface water supplies for the last three years in the state. Each supply is tested every 4½ to 5 months. A limited number of ground water supplies, primarily those with very shallow wells, were also originally checked. However, nothing was found in these ground waters, so this part of the sampling operation has been dropped.

Pesticides that are monitored include aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, lindane, methoxychlor, toxaphene, parathion, 2,4-D, and other organophosphates. (See table for Illinois standards.) The IEPA sets a screening level for most pesticides well below state drinking water standards. When water sources are found with pesticides above the screening level, the samples are retested to determine the exact level of pesticides.

The most frequently detected insecticide in Illinois waters was dieldrin, said Hurley. However, no value has ever exceeded 0.1 ppb (parts per billion). The state standard for dieldrin is 10 times as great at 1 ppb.

Iesticide name	Max. allowable 12-mo. avg. concentration in parts/billion (ppb) (state standard)	State screening levels in ppb*
Aldrin	1	0.05
Chlordane	3	0.05
DDT	50	0.1
Dieldrin	1	0.1
Endrin	0.5	0.1
Heptachlor	0.1	0.05
Lindane	5	0.05
Methoxychlor	100	0.5
Toxaphene	5	5
Parathion	100	**
2,4-D	20	**

* If detected at this level, pesticide concentration is quantified exactly.
**No screening level set.

ILLINOIS STANDARDS. Pesticide levels in Illinois surface public water supplies have been found to be considerably below the allowable limits set for drinking water according to the Illinois EPA.

Non-Point Sources of Livestock Waste Studied

(The third in a series describing the work of the five subcommittees to the Task Force on Agriculture Non-Point Sources of Pollution.)

Large feedlots in the state can be controlled as point sources of pollution, but all the small feedlots, pasture operations, and runoff from farmland where wastes have been spread are considerably larger problems to control, said Dale Vanderholm, chairman of the Livestock Waste Subcommittee to the Ag Task Force.

The subcommittee will be studying various types of livestock operations in the state and determining their problems or pollution potential, the magnitude of the problems, and possible solutions.

NPDES Program Implemented

The National Pollution Discharge Elimination System program, NPDES, has been regulating the large feedlot operations (approximately 33) in the state since 1975. Illinois regulations, which were amended in September, 1974, will also influence livestock waste management when they go into effect in the future. But the effects of non-point or smaller operations are essentially unregulated, according to Vanderholm.

Several universities in the country, including North Carolina State, the University of Minnesota, and the University of Wisconsin have done research on runoff from pastures and other land areas where manure has been spread, both in the summer and on snow and frozen ground in the winter. These are all potential non-point sources of livestock waste pollution.

Subcommittee Studies Research

The subcommittee plans to study the research already completed and decide what management practices might be significant problems in Illinois.



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In addition, Vanderholm is principal investigator on a federal EPA funded project studying vegetative filter stripping. The subcommittee will be evaluating this project as one control system for feedlot runoff. Filter strips are grassy areas serving as treatment devices for agricultural wastes like trickling filters and other components do in municipal waste treatment plants. The filter strips trap wastes contained in feedlot runoff and other agricultural runoff, keeping them from polluting rivers and streams that may run through or near farm property.

After the problem assessment phase is completed, the subcommittee will identify alternative problem solutions and determine which solutions are best technically, economically, and socially. They will also try to estimate which implementation methods would be most effective and make recommendations to the total Ag Task Force.

State Water Survey Investigates Sedimentation

The Illinois State Water Survey will be conducting a detailed sedimentation survey of lakes Vermilion, Taylorville, and Springfield over the next year funded by the Illinois Institute for Environmental Quality (IIEQ), according to John B. Stall, project leader and member of the Ag Task Force.

The purpose of the project is to provide a basic understanding of soil losses, sediment delivery rates, and sediment deposition in three typical lakes in Illinois. Findings will be used by the Ag Task Force's Subcommittee on Soil Erosion and Sedimentation.

The detailed calculation of soil losses for these three watersheds in Illinois will illustrate the value of the Universal Soil Loss Equation (USLE) in quantifying

potential sediment problems for any stream in the state. Cross sections of water depth and sediment thickness taken from the lakes will determine the amount of sediment deposited in each lake. The ratio between watershed soil loss (using the USLE) and those measured amounts of sediment found in the lakes is known as the sediment delivery ratio. The results of the ratio calculation may be ultimately used to determine the life of a reservoir or other body of water.

Water survey samples will also be examined by the Illinois EPA for residues of pesticides commonly used in the watersheds. This information, in conjunction with data from the Pesticide Use Survey supported by the Ag Task Force's Pesticides Subcommittee, will be used to determine the water quality effects of pesticides in the watersheds.

Dates To Remember

January 31 - Ag Task Force meets in Urbana. Black Creek, Indiana sedimentation study will be discussed.

March 3 - TeleNet conference, Urbana. To discuss "208" statewide water quality planning.

March 10 - Design Conference on Livestock Waste Management Systems in Illinois. Contact Dale Vanderholm, U.I. Department of Agricultural Engineering, for more details.

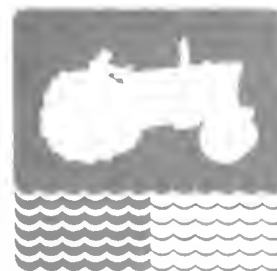
Robert D. Walker

Robert D. Walker
Extension specialist
Natural Resources



"208" Update for Agriculture

AGRICULTURAL ISSUES RELATING TO STATEWIDE WATER QUALITY PLANNING



Vol. 1, No. 5

February, 1977

Water Quality Planning and Agriculture: Subject For Statewide TeleNet in March

How ag-related activities affect state water quality will be the subject of a statewide TeleNet program March 3 sponsored by the U.I. Cooperative Extension Service.

TeleNet speakers will be representatives from the Ag Task Force, members of the Illinois Environmental Protection Agency (IEPA), and concerned citizens, according to R. D. Walker, coordinator of the program.

TeleNet Participants

Participants will include Daniel J. Goodwin, water quality program manager, IEPA; James F. Frank, chairman of the Ag Task Force and ag adviser for the IEPA; Morris E. Nelson, Illinois Agriculture Association; and Judy Joy, Illinois Environmental Council. Each Ag Task Force subcommittee chairman will also present a report of his subcommittee's activities, including Dale H. Vanderholm, livestock waste; J. Keith Leasure, fertilizers; William H. Luckmann, pesticides; Robert D. Walker, soil erosion and sedimentation; and Gerald M. Aubertin and James B. Mowry, forestry and fruit production.

Program topics will include an explanation of Section 208 of the Federal Water Pollution Control Act Amendments of 1972, a review of the possible sources of ag-related pollution, and a description of the statewide water quality planning process.

Farmer and Consumer Concerns

Farmer and consumer concerns about water quality will also be discussed, and speakers will identify ways for citizens to express their opinions.

TeleNet is the Extension Service's two-way telephone network that provides a live connection between 46 county and regional Extension offices and the Urbana campus. This particular TeleNet gives anyone interested in water quality planning the opportunity to hear people involved in water quality policymaking and data gathering. Listeners will also be able to direct

comments and questions to speakers from any TeleNet station in the state.

If you are interested in participating, contact your local Cooperative Extension Service adviser for the location of your nearest TeleNet station.

EPA: Regs Not Key to Successful BMP Program

A regulatory program alone is not going to be the key to successful implementation of best management practices (BMP's) to control non-point sources of pollution, according to Jim Frank, Ag Task Force chairman and Illinois EPA ag adviser.

He said that educational programs, economic incentives, and the encouragement of an already existing environmental ethic are equally important in creating a workable water quality plan for Illinois.

Planning Misconceptions

At a recent Ag Task Force meeting Frank discussed possible misconceptions citizens might have about the state EPA's role in "208" water quality planning. He also explained that the EPA was attempting to "adjust our thinking so that we can consider all of the various possible control strategies with equal or greater regard than a regulatory strategy."

"As hard as it is for EPA staff to break out of the regulatory rut of thinking, it is just as difficult for persons such as yourselves who have worked with the EPA for several years as a regulator to adjust your thinking," Frank said.

"If some of the areas of the specific charge to the subcommittees seem trivial or prying, give them your best objective effort so that we may have a thorough final product that has left no large stones unturned," he said.

"208" Intent

Frank said that to refuse to look at a potential problem, fearing the EPA may seize upon an admission of pollution as a chance to regulate the source, is not in keeping with the intent of the "208" planning process.

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While point sources of pollution, such as discharge from large manufacturing plants, are already regulated through the National Pollution Discharge Elimination System (NPDES) permit program, no such program exists for non-point sources like runoff from fields. When industries take in water from a stream, use it, and add pollutants, they must purify or remove these pollutants before the water is discharged to the stream. This system is simply not feasible for non-point sources.

Best management practices, as defined by the federal EPA, are practices that prevent these non-point source pollutants from entering surface waters. An important factor in determining the best practices is practicality—choosing practices that are technically, economically, and socially feasible.

Possible Fertilizer Problems Studied

(The fourth in a series describing the work of the five subcommittees to the Task Force on Agriculture Non-Point Sources of Pollution.)

The Fertilizer Subcommittee is seeking solutions to reduce possible nitrate and phosphate pollution in Illinois water without reducing land productivity.

Nitrogen and phosphorus are the two plant nutrients of primary concern in statewide water quality planning efforts. Excess nitrates in drinking water can be a serious health threat to infants, and both nitrogen and phosphorus contribute to the undesirable growth of algae in lakes and ponds. However, no conclusive evidence points to agriculture as the primary culprit in adding these pollutants to our water supply, according to J. Keith Leasure, Department of Plant and Soil Science, Southern Illinois University and chairman of the Ag Task Force's Fertilizer Subcommittee.

Leasure said that the major responsibility of the subcommittee is not to develop new research data on possible fertilizer caused water pollution. Rather the subcommittee intends to use research already available to make a "judgment call" about where the pollution might be coming from.

"We have to operate under the assumption that some of the nitrates in Illinois waters are coming from fertilizer application and other reasonable management practices that will help keep fertilizers on the land and out of the water," he said.

Leasure said that if nitrate levels remain just as high or increase when these best management practices are used consistently, then fertilizers can be ruled out as primary pollution contributors.

Members of the subcommittee are also studying programs and proposals from other states concerned with fertilizers and their application. All states are striving to meet the same national water quality standards. While each state is viewing the problem as it affects itself, an information exchange of information and state laws can be helpful, Leasure said.

The Nitrate Question

The following interview took place with Dr. Samuel R. Aldrich, assistant director of the U.I. Agricultural Experiment Station. Aldrich is a former Illinois Pollution Control Board member, serving from 1970 to 1972, and wrote the Board opinion following 10 public hearings on possible regulations governing plant nutrients in 1972. The Board determined that there was no basis for regulation of nitrogen or phosphorus in Illinois at that time. Aldrich was also project leader of a Rockefeller-funded study in the U.I. College of Agriculture on the environmental effects of nitrogen which was just completed.

Q: How serious is the problem of nitrates in Illinois rivers today, and what appear to be reasons for their pronounced increase?

First, let me point out that some rivers show a marked increase in nitrates; others do not. My concern is less about present levels than about the longer-term future when large increases of nitrates may result if we continue to farm more intensively to meet rising food needs. Nitrates in our waters don't only come from commercial nitrogen fertilizers, however, but also from decomposition of soil organic matter; fixation by soybeans, alfalfa, and clovers; precipitation; soil organism fixation of atmospheric nitrogen; animal and human wastes; and other organic wastes. In fact, in the U.S. more than eight times as much nitrogen has been released from organic matter as from all commercial fertilizers produced to date. It is important to recognize the other sources producing nitrates and to understand that nitrogen fertilizers are no more nor less apt to leach nitrates into our water systems than these other sources.

Q: If fertilizer application is one of the sources of nitrates that could be controlled by reduction, what would be the effects of cutting down on fertilizer usage?

It is my belief that the quantity of food that is produced rather than the particular form in which nitrogen is supplied governs the amount of nitrates potentially available for reaching surface and groundwater. In order to reduce the nitrate load, the total amount of crops would have to be reduced. Farmers would attempt to offset the reductions in acre yields by growing more acres. Since all acres formerly in the conservation reserve are now being cropped, expansion could only occur on marginal land—steep, drouthy, or wet.

It would, however, be a mistake to assume there are no undesirable environmental effects from increasing the acres of cropland. These additional acres would increase runoff and erosion, would require extra fossil fuel to farm, and would require the use of additional herbicides, pesticides, and fertilizers as well.

Another concern exists—rising food costs borne by the consumer. A smaller supply created by the lower

yields could increase the cost of food, according to one expert, by a predicted 23 percent by 1980 if a 50 pound per acre limitation were placed on nitrogen.

Q: Can the federal government prevent a nitrate problem by setting a national policy for nitrogen application or is this a state problem?

I really think this is a site specific problem. By that I mean that a national policy would, by virtue of its scope, be a general approach to control and would produce inequities among regions and between neighbors. The nitrate question really deserves a more specific answer depending on a number of locational variables. Basically, nitrogen movement depends upon soils, climate, crops, and farmers' practices. Therefore, to control fertilizer application from Washington would simply not be feasible. If and when a problem arises specific solutions tailored to various parts of the country would be a necessity in order to be fair and effective.

Q: Because nitrogen movement is so hard to predict, any controls that might be placed on nitrogen fertilizer could not be guaranteed effective anyway. Why?

Nitrogen movement is extremely variable and is especially affected by time and amount of rainfall. Soil temperature determines whether nitrogen will change to the leachable nitrate form. The time of the year nitrogen is applied to the soil in relation to when it is taken up by crops and the conditions that prevail before plant growth begins and after it ceases in the fall are critical, too. If the nitrogen is converted to nitrate in the late fall, it is not taken up by growing plants; hence it is much more apt to leach down through the soil profile and end up in surface or groundwater. No one is sure how much nitrogen is lost following the denitrification process either. Other factors that make prediction difficult include the unknown amount that is tied up by soil organisms as they decay stalks, straw, and other residues, and the time it takes for nitrates to move by base flow to surface waters.

One key, however, to reducing nitrates in water from crop production practices is to minimize the quantity of nitrate in the soil from mid-October to late December.

Q: What do you think about the goal of a 95-98 percent yield rather than a 100 percent yield as a way to cut down on excessive fertilization and excess nitrogen leaching away?

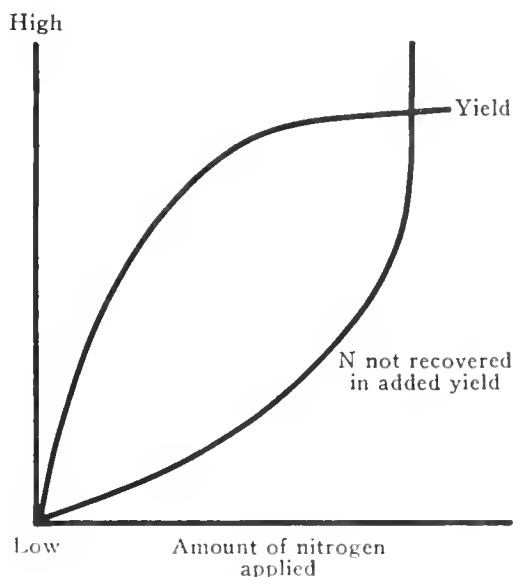
I think it is fairly well known that the extra nitrogen needed to arrive at a 100 percent yield is proportionately quite large (see illustration). If society's goals include less nitrates in water, reducing the yield by a few percent would help to obtain this environmental advantage. But, of course, these decisions have to be made in the light of increased demand for food.

It is absolutely crucial that a farmer maintain high yields through timely planting, optimum plant population, and weed control in order to make effective use of the available nitrogen. Incidentally, we have recently

learned that corn following soybeans obtains 30 to 50 pounds of nitrogen per acre from the nitrogen remaining after beans. In Illinois about two-thirds of the corn acres follow beans or meadow.

Q: What appear to be the environmental trade-offs of our food production technology?

The amount of nitrates reaching streams per unit of food produced is an important yardstick to evaluate the impact of agricultural technology on the environment. Contrary to the view often expressed in environmental literature, food production in Illinois appears to be increasing more rapidly than nitrates in water. In terms of grain equivalent, crop production is presently about 2.5 times greater than in 1940. Based on Illinois Water Survey data, the nitrate load has increased somewhat less. The actual concentration of nitrates in water is of concern, of course, but a "nitrate pollution index" per unit of food helps to place in proper perspective the impact of food production techniques on the environment. Shifts in cropping systems and great increases in fertilizer use in Illinois since 1940 have improved the capability of agriculture to meet food needs without a corresponding increase in undesirable impacts on the environment in the form of nitrates, erosion, floods, and sediment pollution.



DIMINISHING RETURNS. There is a point when the addition of extra nitrogen fertilizer does not increase yields substantially, and all the additional nitrogen is left in the soil.

EPA-SBA Loan Program to Fight Water Pollution

A new loan program to assist farmers in controlling erosion and chemical run-off from their farms has been established by the Small Business Administration in conjunction with the U.S. Environmental Protection Agency.



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Farmers eligible to participate include individuals as well as corporate, proprietorship, and partnership farming operations. The applicant's gross sales, however, cannot exceed \$275,000 annually. No formal limit has been set for the loans, but those over \$500,000 will require a special review.

Loans will be made by the SBA following certification from EPA's regional offices that the loans will be used for activities that will help meet clean water requirements.

The present loan rate is 6% percent, although the rate may fluctuate from time to time. Loans may extend for a term of up to 30 years.

Indiana Farmers Under District Agreement

Ninety-five percent of the farmers in the Black Creek watershed in northeastern Indiana have signed agreements with their local soil conservation district to employ best management practices at a cost of approximately \$105 per acre, according to leaders of the U.S. EPA funded project, "Environmental Impact of Land Use on Water Quality: The Black Creek Study."

Cost Sharing Important

Cost sharing has been a large factor in getting these practices started, said James Morrison, information specialist on the project. Cost sharing payments were about \$75 per acre to the landowner plus \$30 per acre for Soil Conservation Service assistance. Each farmer also incurred about \$30, himself, in fulfilling his conservation pledge.

Speaking to a recent Ag Task Force meeting in Urbana, Black Creek researchers said that approximately 87 percent of the land in the watershed has been adequately treated with conservation practices.

District Contact Significant

Soil conservation district contact with area farmers was the most significant factor in getting these conservation practices adopted. Employment off the farm was also important in determining acceptance of new farming techniques, according to William L. Miller, Purdue ag economist on the project.

The Black Creek study, which is in its fifth year of activity, is studying the role that agricultural pollutants, especially soil erosion, play in water quality degradation. Purdue soil scientists studying the watershed are convinced that crop residue on land reduces erosion, and that soybean land is more erodible than corn land because of a lack of residue after harvest.

Dates to Remember

February 28 - Task Force Meeting, Levis Center, Urbana. Homer Kuder will discuss the *1970 Conservation Needs Inventory* developed by the U.S. Department of Agriculture.

March 8 - TeleNet on "208" statewide water quality planning. Begins at 1:15 p.m. Contact your local Cooperative Extension Service adviser for the closest TeleNet station.

April 25 - Assessment of ag related water quality problems. Report due to the Illinois EPA from each Task Force subcommittee.

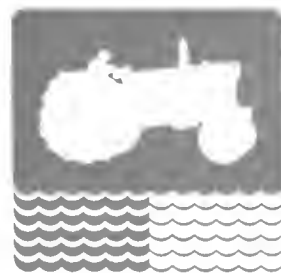
Robert D. Walker

Robert D. Walker
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"208" Update for Agriculture

AGRICULTURAL ISSUES RELATING TO STATEWIDE WATER QUALITY PLANNING



Vol. 1, No. 6

March, 1977

Aquatic Biologist: Keep Streams Natural

Jim Karr is an associate professor of ecology at the University of Illinois who recently joined the staff from Purdue. While at Purdue he was heavily involved in an EPA-funded water quality project on the Black Creek watershed in Indiana.

Q: During the last few years you've been studying the effects of sedimentation on aquatic life in a northeastern Indiana watershed. Why waste time and money studying a few fish? What have you really learned about improving water quality from your work?

This is an important question — what does the study of aquatic life really tell us about the water quality of our lakes and streams? Nutrient and sediment loads that have had a negative effect on sport and commercial fishery have affected urban, domestic, and industrial uses of water, too.

The fishes and aquatic life of our smaller streams are part of a complex food chain which feeds the biotic system of the rivers. Failure to maintain the water quality of the smaller streams above the river will inevitably result in the loss of fishery in the main river. We can compare the small streams of the main river to the leaves of a corn plant. If the leaves which feed the corn plant are diseased, the corn plant will not be healthy and may even die. When the fish die and when aquatic life is severely disturbed, this is a real indication that the water quality of a particular stream could be hazardous for human uses, too.

Q: Are there any conservation practices that can be applied to the land that will appreciably improve water quality?

It is important to remember that, historically, conservation practices, especially on farmland, have been applied in order to maintain the productivity of the soil. Too much erosion was bad for farming. Now people are becoming more concerned about their water supplies. They want certain practices applied that will keep the soil on cropland, not only to increase productivity, but equally to keep it out of the waters. There are some practices that appear to be effective at doing both.

Green belts along streams are an especially good example. Green belts are grassy strips or forested areas along streams that slow down sediment from polluting our waterways. An equally important part of this practice is keeping as many streams as possible along the belts in their natural meandering state rather than channelizing them.

Q: What does stream channelization do other than help drain farmland more quickly?

You're right in saying that channelization does help drain farmland more quickly. This is one reason why it is so popular. But at what cost? Channelization straightens the stream, increasing its energy and capacity to erode the streambank. On the other hand, allowing a stream to maintain its natural course, pooling and riffling, provides the necessary habitat for fish and other aquatic life to flourish. This means recreational benefits for us all.

Most streams untouched are also usually well-shaded which alleviates the clogging algal blooms frequently a problem for the sunlit channelized waterways. A stream, when it has been channelized and straightened, must be often redredged at tremendous cost or it will return to its natural meandering state. Instead, why not build on the natural systems, making them work for us to improve our water quality?

Citizen Concerns Voiced on TeleNet

Ending the worst abuses of our waters is the goal of concerned citizens, said Judith Joy, Illinois Environmental Council and Ag Task Force member, at the March 3 statewide TeleNet program on "208" water quality planning.

If we can end these abuses without undue burdens on farmers and on taxpayers and without creating another governmental superagency, this is what we should be striving for, she said.

BMP's Cheapest Solution

Best management practices (BMP's), including green belts, spring instead of fall plowing on sloping land, forage crop production, contour farming, and other

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erosion control strategies, are the cheapest solutions in the long run, Joy said.

Morris E. Nelson, Illinois Agriculture Association and Task Force member, in voicing farmer concerns, asked if society is willing to bear the additional costs of implementing BMP's. With food production at the present level and growing, we've got to expect some pollution, he said.

Consider Future Benefits

We too frequently look on the negative rather than the positive side of BMP's, according to Louise Rome, League of Women Voters of Illinois and Task Force member. The future benefits have got to be considered, as well as the present anticipated burden, she said.

Keith Leasure, chairman of the Task Force's Fertilizer Subcommittee, suggested that the public consider that the bill for implementing a nationwide water quality program could run as much as \$200 billion. He asked, "How pure is good enough?"

In addition to citizen discussion, program topics for the two hour TeleNet session included an explanation of Section 208 of the Federal Water Pollution Control Act Amendments of 1972, a review of the possible sources of ag-related pollution, and a description of the statewide water quality planning process. Approximately 37 stations across the state participated.

Tillage System Important Erosion Factor

A farmer can't change the type of soil on his farm and he can't alter the slope of the land. What can be changed is his tilling procedure.

According to Purdue agronomist Jerry Mannering, given a particular piece of land, the two most important ways of conserving that soil to prevent erosion are "to increase the amount of surface cover remaining after fall tillage and to increase surface roughness."

Simulated Rainfall Experiments

Mannering is a researcher on the Black Creek Demonstration Project, operating in the 12,000-acre Black Creek section of the Maumee River watershed in north eastern Indiana. He has been using simulated rainfall experiments to recreate some of the weather sequences which might take a 50 year span to occur in nature. Both corn and soybean plots have been tested using various fall tillage treatments: no tillage, light disking, chisel plowing, and moldboard plowing. Each section has then been treated similarly, receiving a 2.5 inch rain within a period of one hour with a second simulation repeated 24 hours later.

Samples have been taken of the runoff to measure the amount of sediment and nutrient losses. In the spring each treatment plot has also been tested for the amount of surface cover or crop residue remaining and the relative roughness of the surface.

Fall Tillage Distinctions

In the spring the ability to distinguish between the type of tillage system that had been used in the fall was greater for the corn fields than for the soybean fields. However, little difference was noted between the no tillage and the light disking treatments; both proved relatively effective in holding down the topsoil. According to Mannering, chisel plowing is effective in reducing soil loss, if "residues are plentiful and the surface remains rough."

While crops are standing there is little difference in erodability between the corn land and the soybean land. After harvest, corn stubble offers more resistance to the flow of water than soybean residue, Mannering said.

Conservation Needs Inventory Describes Erosion

If all Illinois land could be assembled into one hill, almost half of that hill would have a slope of less than 2 percent, and an additional 30 percent would have slopes of 2 to 7 percent. However, despite the predominance of flat land, Illinois does have a widespread erosion problem, according to Homer Kuder, former Soil Conservation Service employee and chairman of the committee that produced the *1970 Conservation Needs Inventory*.

Kuder, who spoke at a recent Ag Task Force meeting, said to make a good assessment of the water quality problem, we need to understand the extent of erosion in Illinois. How much sediment is being created by erosion and what the adverse effect is on our streams must both be determined, he said.

Tools for Predicting Soil Loss

Two tools are useful for predicting soil loss, according to Kuder. The Universal Soil Loss Equation is excellent for estimating soil loss from a specific land category. The *Conservation Needs Inventory* (CNI) calculates the acres of land in each soil category. By multiplying the soil loss rate by the number of acres in the various land categories, as shown in the CNI, we can estimate total soil erosion in Illinois, Kuder said.

The data used to develop the CNI was gathered by the Soil Conservation Service in 1967 in cooperation with other major USDA and state agencies. The SCS field staff surveyed 4,500 random sample quarter sections, and detailed soils maps were made for each sample section. Through a combination of statistical evidence and subjective impressions, the SCS determined the erosion problems and use of each quarter section. Using this information, they determined the one most needed conservation practice for each sample area.

Inadequately Treated Land

According to inventory results, of the state's total land area, 60 percent is cropland, and of that cropland, 66

percent needs soil erosion protection or improved drainage. A permissible soil loss per acre per year is 3 to 5 tons, depending on the soil type.

If the origin of most sediment can be determined with the CNI, then by estimating the sediment delivery rate to streams, we can assess the stream-loading problem, Kuder said. Principal source of this eroding soil is the gently rolling (3 percent average slope) cropland, because it is so intensively cropped, he said.

Forestry Operations Studied

(The fifth and final article in a series describing the work of the five subcommittees to the Task Force on Agriculture Non-Point Sources of Pollution.)

The Subcommittee on Forestry and Fruit Production is operating somewhat differently than the other subcommittees advising the Illinois EPA on agriculture non-point sources of pollution. Last summer the Illinois Institute for Environmental Quality (IEQ) contracted directly with the School of Agriculture at Southern Illinois University (S.I.U.) to study forestry and fruit producing activities in Illinois and to make a report to the Illinois EPA in one year.

According to Gerald Aubertin, professor of forestry at S.I.U. and chairman of the subcommittee, members on the subcommittee, however, are studying the problem area in much the same way as the other Task Force subcommittees. The goal is to provide a list of best management practices (BMP's) that can be applied in forestry and fruit production to improve the state's water quality.

Erosion Problems and Forestry

Most commercial forestry takes place in the more rugged areas of southern Illinois which is about 30 percent forested. Erosion is one of the major problems to be examined in order to determine how much is man-caused due to forest management practices.

Realistically, however, there is little we can do to reduce the type and amount of material reaching our streams under natural, undisturbed conditions, Aubertin said. We will be looking at logging operations and the forest debris they may be creating, as well as fertilizer and pesticide applications to forests and their effects on water quality, he said.

Aubertin explained that it is important to come up with management practices that can improve stream quality and, at the same time, still enable forest operations to continue providing necessary products.

Water Quality and Fruit Production

James Mowry, superintendent of the Illinois Horticultural Experiment Station in Carbondale, is directing the fruit production part of the research. His study group will be personally interviewing the approximately 150 commercial orchard managers in the state to determine orchard practices now in effect. According to

Mowry, he is particularly interested in the individual fruit grower's approach to erosion control and fertilizer and pesticide usage. Studying the spray schedules of these orchard managers will provide essential information about application practices now used.

Adoption of Environmental Practices Studied

Environmentally sound practices farmers considered profitable had high rates of adoption, according to J. C. van Es, U.I. rural sociologist, Department of Agricultural Economics, in describing the results of a survey conducted with southern Illinois farmers in 1974.

The survey conducted by telephone interview with 233 farmers covered two areas. The farmers were asked which of a list of several practices they currently used and in what year they first used them. The farming practices included both commercial practices, like marketing strategies, and environmental practices which consisted of soil conservation techniques. The farmers were then asked to rate how profitable they thought each practice was.

Profitability was an extremely important element in determining the rate of adoption of certain environmentally sound techniques. On the other hand, certain commercial practices have been adopted by a sizeable group of the sampled farmers even though they considered them less profitable.

Van Es says that he suspects that the network of supporting institutions, including commercial enterprises, advertising, and the mass media, that advocate certain commercial practices are very persuasive with farmers. He does not believe that a similar campaign advocating environmental practices is likely in the near future. Therefore, the degree of profitability is much more crucial to adoption.

"To introduce less profitable environmental practices will necessitate strong promotional activities. In the long run, it may be necessary to build the kind of support system for environmental practices that's now associated with commercial farm practices, an activity almost reminiscent of the beginning days of the Extension Service."

— excerpted from an article appearing in the *Journal of Extension*, May/June 1976

Fed EPA Calls For "Reachable Objectives"

The director of the federal EPA Water Quality Division said "208" water quality plans need to include "reachable objectives" so that the plans will work.

Joseph Krivak told "208" planners and researchers in Chicago at the Region V-208 Non-Point Pollution Seminar, November 16, that specific output from planning activities in the area of non-point pollution control must be assured. He said the time that planning will

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be successful is when elected decisionmakers, not planners, set the objectives.

Extension's Role

Other speakers included Ellsworth Christmas, Agricultural Extension, Purdue University, who said that Extension's role in the "208" planning process was two-fold: (1) to prepare an educational program to inform the agricultural community about non-point sources of pollution, and (2) to acquaint farmers with alternative best management practices through demonstration projects. Local projects, he said, are most effective because conservation practices that work in one part of the state are not necessarily the best practices statewide.

Rex E. Jones, Division of Water Pollution Control for the Indiana State Board of Health, said that state legislators must become better informed about "208" in order to direct planning efforts through the legislative system.

Consistency and Equity

Jones explained the state's role as one of leadership. He emphasized that any programs to be effective must be consistent and equitable throughout the state.

Congressman J. Edward Roush, member of the U.S. House of Representatives from Indiana, who was finishing his term of office, said that "208" planning must provide "tangible results in the use of the taxpayers' money." Non-point pollution controls will have an impact on a basic resource, food production, and therefore, plans must emphasize economic feasibility, Roush's legislative assistant, James Morrison, said.

Research Across the Country

The University of North Carolina Water Resources Research Institute is involved in an interdisciplinary study to monitor and quantify rural land runoff. It will involve the departments of agriculture engineering, soils, botany, statistics, and civil engineering.

Attempting to define the scope of rural water supply problems in southeastern states and evaluating public policy alternatives to solve these problems are the elements of a new research project sponsored by the Virginia Water Resources Research Center.

The Water Resources Research Center at the University of Minnesota is studying the possibility of aquifer contamination by fertilizer nutrients. The objective is to determine the rate and timing of nutrient movement underground.

Dates to Remember

March 28 Ag Task Force meeting, Levis Center, Urbana.

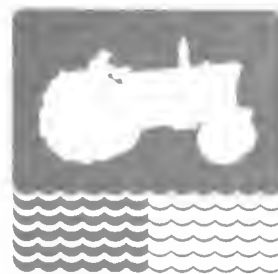
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"208" Update for Agriculture

AGRICULTURAL ISSUES RELATING TO STATEWIDE WATER QUALITY PLANNING



Vol. 1, No. 7

April-May, 1977

Farmers Get Pesticide Application Training

Over 23,000 farmers in Illinois have been trained in the application of restricted use pesticides to their farmland in the past year, according to Steve Moore, Extension entomology specialist and leader of the Extension pesticide applicator training program.

These farmers are now eligible for certification, Moore said, and are only waiting for the Governor's approval of the certification program. It is currently being reviewed by the Illinois EPA.

The pesticide training was developed for county agriculture advisers across the state who present the program to their clientele. A 193-slide teaching guide has been prepared by Extension staff in cooperation with the Illinois Department of Agriculture and the Illinois Natural History Survey for adviser use.

Training sessions for advisers, who teach proper application techniques, were held in November 1975, and all counties have since offered the program to area farmers.

Subjects covered include pesticide toxicity, first aid for pesticide poisonings, dangers of contamination, protective clothing, proper storage, proper disposal, pest identification, understanding pesticide labeling, and proper mixing and application.

In 1975, Congress amended the 1947 Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), providing for stronger enforcement of the registration, transportation, application, storage, and disposal of pesticides. The amended law included the classification of all pesticides by the Environmental Protection Agency (EPA) as either "general use" or "restricted use" pesticides. In order to apply restricted use pesticides, the applicator must be certified.

Lake Vermilion Sedimentation Study Completed

Sedimentation data recently compiled reveal that Lake Vermilion, which was originally impounded in May, 1925, is practically half full of sediment; its storage capacity reduced from 2,781 million gallons in

1925 to 1,518 million gallons in 1976, according to Illinois State Water Survey reports.

The Lake Vermilion study is part of a detailed sedimentation survey of Lakes Vermilion, Taylorville, and Springfield, in order to provide a basic understanding of soil losses, sediment delivery rates, and sediment deposition rates in three typical lakes in Illinois.

Total sediment accumulated between 1925 and 1976 in Lake Vermilion totals 1,262 million gallons, which is approximately one-half ton per acre per year for the entire Lake Vermilion watershed. Erosion rates for the watershed are now being calculated using the Universal Soil Loss Equation (USLE), and delivery rates to the reservoir will also be calculated. These figures will determine the amount of soil eroded from cropland in the watershed and the amount which actually reaches and is deposited in the lake.

Sediment samples from the lake are also being analyzed for pesticide residues and other chemical components. As yet this work has not been completed.

The study, conducted under the direction of James P. Gibb, associate engineer with the Water Survey, is being funded by the Illinois Institute for Environmental Quality.

New Illinois EPA Director Speaks to Ag Task Force

The Illinois Environmental Protection Agency (IEPA) wants to change its image from a negative or "no" agency to an agency that helps people, said Leo Eisel, new director of the IEPA, Springfield.

Speaking to a recent meeting of the Ag Task Force in Urbana, Eisel said that he wants the state EPA to build "good faith" with people who may be affected by environmental legislation.

He said that the various state task forces for water quality planning are important as vehicles for getting people together to talk about programs that will affect them. The Ag Task Force has representatives of all major agricultural and environmental organizations in Illinois. It is advising the IEPA on agricultural matters in preparation of a statewide water quality plan for Illinois.

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The question of what to do with runoff from open feedlots is getting answered through an applied research project on the University of Illinois' experimental dairy farm.

According to Dale H. Vanderholm, professor of Agricultural Engineering and project leader, "Research on Livestock Feedlot Runoff Control by Vegetative Filters" will provide design criteria for building low-cost runoff systems.

Runoff Tested

Rainfall runoff from the dairy feedlots is being collected and immediately spread over grassed areas after passing through a small settling basin. The runoff flows down the field slope, and effluent that finally comes off the test plots is being measured for nutrient and bacterial levels. The runoff is never actually stored but is treated in the vegetated area by filtration, settling, infiltration, dilution, and other processes. The largest storm analyzed has been a 24-hour, 2½ inch event.

While some of the effluent's nutrient and bacterial levels are still higher than state water quality standards, Vanderholm said that quantities coming off the fields are small enough that they can rapidly be diluted in streams.

The research, which is in its second year, is a cooperative project between U.I. Departments of Agron-

omy, Agricultural Engineering, and Dairy Science and the Illinois Environmental Protection Agency. It is being supported by the Illinois Institute for Environmental Quality, the U.S. EPA, and the Illinois Agricultural Experiment Station. The project will be ending next February.

Flow Distance Critical

The flow distance is one of the most critical variables in designing a successful system, Vanderholm said. A long, narrow field or strip allows wastes to percolate into the soil more effectively than a short, wide one.

The test plots have been sown with Reed's canary grass, bromegrass, and orchard grass to study the effectiveness of each in treating the water, as well as to analyze for nutrient effects on yields over time. Forage harvested from the plots is used for feed at the dairy.

Vanderholm said there may be some problems with salt and nutrient buildups. However, a farmer would probably have to spread the runoff on the same field for five to ten years before growth was really affected, he said.

Design recommendations for the vegetative filters will perhaps include a schedule for rotation of grass areas to control these nutrient concentrations, Vanderholm said.

An answer to feedlot runoff?



5.





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Design for Optimal Productivity and Water Quality

Meeting goals for controlling agricultural non-point source pollution means attempting to optimize rather than maximize both agricultural productivity and water quality, said Warren W. Brigham, aquatic biologist, Illinois Natural History Survey. Some trade-offs will have to be made from both the point of view of agriculturalists and environmentalists.

Erosion control measures that might work to keep soil on cropland do not necessarily keep plant nutrients, such as phosphorus, out of our water systems, Brigham said.

Using minimum tillage, fertilizers are applied to the field surface rather than being plowed under as in a conventional operation. Unfortunately, these techniques often yield a very high percentage of total phosphorus in the surface runoff, Brigham said that many studies show, on the average, 25 percent of the phosphorus applied as fertilizer ultimately reaches surface streams. This isn't good economics for farmers or the public, he said.

Perhaps new farming techniques need to be designed that will help merge soil erosion measures with ways to control nutrient runoff. A new technology must be found to bind nutrients to the soil and soil to the land, Brigham said.

IIEQ Funds Pesticide Research

The Illinois Institute for Environmental Quality (IIEQ), Chicago, has agreed to fund two pesticide research projects in cooperation with the Ag Task Force's subcommittee on pesticides, according to James F. Frank, chairman, Ag Task Force.

The Illinois EPA is still negotiating with the federal government for additional funds to support the two research projects on container disposal and disposal of dilute rinse solutions from custom spray equipment.

Principal investigators on the projects are Keith Leasure, S.I.U., container disposal system; and Fred Slife, U.I. Department of Agronomy, Dale Vanderholm and Loren Bode, U.I. Department of Agricultural Engineering, rinsate solution disposal.

July TeleNet Scheduled

Another TeleNet session on water quality and agriculture has been set for July 7, 7:30 p.m. to 9:30 p.m.

Ag Task Force subcommittee chairmen will describe the problem assessment made by task force members in the areas of fertilizers, pesticides, soil erosion, livestock wastes, and forestry and fruit production. These assessment reports were recently submitted to the Illinois Environmental Protection Agency as part of the statewide water quality planning process.

The public is urged to participate. Check with your county Extension office for the TeleNet location nearest you.

Robert D. Walker

Robert D. Walker
Extension specialist
Natural Resources

Illinois Department of Agriculture is published monthly by the Cooperative Extension Service of the University of Illinois at Urbana-Champaign for agricultural and environmental issues in the state. It is submitted in part with funds provided by the Illinois Institute for Environmental Quality. Robert D. Walker, project leader, Carol L. Moxhead, editor, design, and comment are invited and should be sent to: Moxhead Hall, Urbana, Illinois 61801-2171 333-1180.

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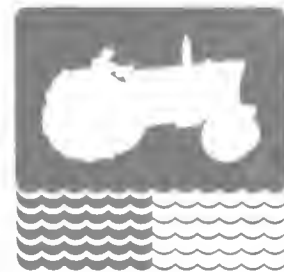
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"208" Update for Agriculture

AGRICULTURAL ISSUES RELATING TO STATEWIDE WATER QUALITY PLANNING



Vol. 1, No. 8

June, 1977

Ag Problem Assessment

Subcommittee Debates Water Quality

The Soil Erosion and Sedimentation Subcommittee of the Ag Task Force recently submitted a list of sediment related problems in the state to the Illinois EPA; however, the subcommittee has been unable to agree on when sediment detracts from water quality, according to R. D. Walker, subcommittee chairman.

Two Points of View

One point of view is that all sediment that reaches a stream or lake is a pollutant and remains a pollutant even after settling out of the water. The other point of view is that sediment deposited in a stream or lake is not a pollutant after settling to the bottom unless re-suspended or unless pollutants are released back into the water, Walker said.

"This has caused us to break down the list of water quality problems caused by sediment into three categories," he said. The categories are suspended sediment, sediment as a carrier, and deposited sediment.

Walker said that the subcommittee hopes to resolve the issue as they move towards recommending best management practices to control soil erosion.

Conclusions drawn in the assessment are based on data currently available, and the subcommittee reserves the right to change its position on any issue if evidence is found which conflicts with its original conclusions, Walker said.

Sediment Problems

According to the subcommittee report, **suspended sediment can:**

- increase treatment costs of municipal and industrial water supplies.
- lessen the esthetic appeal of water — sight, odor, and taste.
- increase wear on pumps, boats, and boat motors.
- stain or corrode fishing and boating equipment.
- reduce light penetration thereby reducing photosynthesis and primary production.
- reduce the visibility for sight feeding fish and the fisherman's ability to catch these fish.
- increase the safety hazard for boaters, swimmers, and water skiers by reducing visibility in water.

(Continued on page 4)

Erosion source	Acres (in thousands)	Annual erosion (in millions of tons)	Percent	Average annual tons per acre
Agricultural land (sheet and rill)	32,158	141.6	85.9	44
Cropland	24,361	123.9	75.1*	5.1
Pasture land	3,345	10.0	6.1*	3.0
Woodland	3,585	5.5	3.3*	1.5
Other agricultural land	867	2.2	1.4*	2.5
Gully erosion (all lands)	—	9.3	5.6	
Nonagricultural (rural land)	656	1.7	1.0	2.6
Federal land	413	.5	.3	1.2
Urban and built-up land	2,451	4.9	3.0	2.0
Stream bank erosion	—	7.0**	4.2	
TOTALS	35,678	165.0	100.0	

* Percent of total soil erosion.

** The delivery ratio is 100 percent in the case of stream bank erosion, whereas it is lower for sheet and rill erosion. Thus, this source may be more important than indicated by the small percent of total estimated erosion.

SOURCES OF EROSION. Sheet and rill erosion occurring on agricultural land is by far the largest single source of sediment in Illinois. This estimate of current levels of erosion is based on current cropping practices and acreage figures from the 1967 *Conservation Needs Inventory*. While the rate of erosion per acre is greater on steeper land in the state, it has been discovered that gently sloping (2-5 percent) land, which describes a majority of Illinois land, accounts for more total erosion.

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THE FOLLOWING interview about phosphorus and its implications for water quality took place recently with E. E. Kurtz, professor of soil fertility, U. of Illinois Department of Agronomy. Kurtz has spent much of his professional career researching phosphorus and nitrogen soil chemistry. In collaboration with another soil scientist, he developed the P-1 and P-2 tests for determining available phosphorus in soils. His extensive research has also resulted in more efficient use of phosphorus fertilizers and in substantial yield increases.

Q: How serious is phosphorus in Illinois water systems today?

While we should do what we reasonably can to avoid abnormally high levels of contamination, there are several environmental problems that worry me much more than inorganic phosphate in Illinois waters. Since I understand that Illinois is making progress in reducing many of the major point sources of phosphate, I don't expect that the remaining minor sources are going to be a great threat.

Phosphorus, as inorganic phosphate, at a concentration of a few tenths of a part per million is not going to poison us. It is not very toxic at all. It is not added to our fields to kill anything. On the contrary, at the concentration ranges we are talking about phosphorus makes things grow.

The main problem with phosphate in water is that it encourages growth of algae which turns the water green. This eutrophication does not occur in flowing water but it can be extensive in ponds, lakes, and reservoirs. The algae growing in the water influences the amount of sunlight penetrating the water and in turn influences the kind and amount of flora and fauna

is very slow. At the present time, additions of fertilizer to most soils are not detectable as increased phosphorus in the drainage. Of course, if phosphorus is continually added to soils in excessive amounts for long periods of time, we would expect the soils to become saturated to a level that fertilizer phosphate would appear in drainage. This usually takes a long time, however.

We should remember that phosphorus is quite different from nitrogen. Attachment of fertilizer nitrogen to the soil is quite limited. A good portion of the fertilizer nitrogen applied in the spring of this year, and not utilized by crops, may be found in the drainage water by the spring of next year. Movement of fertilizer nitrogen in the soil water can be extensive.

Even though phosphorus has a strong attachment to the soil, there is always a little phosphorus present in soil water. An equilibrium between the phosphorus attached to the soil and the phosphorus in the soil solution is consistently maintained. This means that if more phosphorus is added to the solution, more phosphorus becomes attached to the soil. If phosphorus in solution is removed, phosphorus is released from the soil. Thus, the soil phosphorus attachment acts as a regulator on the concentration in solution.

I estimate that the phosphorus in tile drains is normally in the range of 0.03 to 0.2 parts per million, and I regard these concentrations as the equilibrium levels we are likely to find in our soils.

Q: Could limiting fertilizer applications contribute to water quality while enabling farmers to maintain yields?

It will take a long time for the effects to be reflected, but today many farmers are using more phosphorus

Water Quality and Phosphorus

in that body of water. There are also problems if the water is intended for domestic use. No one wants to drink green water. After eutrophication has occurred, costs for removal of algae and bad tastes may be appreciable.

I doubt, however, that we can reduce the phosphorus in Illinois surface waters to a level that is insufficient for the growth of algae. I don't think the levels were ever that low. Early travelers across this country described "green, scum-coated ponds" in Illinois. At that time, phosphorus must have been at its natural level.

Q: What happens when water soluble fertilizers are added to the soil? Does this pose problems for water quality?

Adding phosphate to the soil doesn't increase the problem nearly as much as might be expected. Although the phosphate in the fertilizer dissolves in the soil water, very little ever moves through and out of the soil and into the drainage water. Except in very sandy soils, phosphorus applied as fertilizer attaches to soil particles so tightly that its movement through the soil

than they really need. From extensive soil testing we know that the phosphorus in two-thirds of our farmland has been built up beyond the level where further increases in yield can be expected.

When fertilizer use became common in Illinois, our soils were badly depleted. In order to get maximum yields, much more phosphorus had to be added than was recovered by the crops. Because of the attachment of the fertilizer phosphorus to the soil, the phosphorus levels in our soils had to be built up over a period of years. This buildup has now been accomplished in many of our soils, and additions should be cut back to approximate maintenance or crop removals.

I understand that the current Illinois water quality standard is 0.05 parts per million for total phosphorus in lakes or streams at the point of entry into a lake. Since this concentration is less than that already present in some tile drains, I believe the quality standard will be unattainable in many areas. Sigurd W. Melsted, U. of I. professor of soil chemistry, has been studying the data and he finds water in most of the reservoirs in Illinois is above the 0.05 parts per million level. I think this sup-

ports my belief that the standard may be unrealistic for at least some parts of the state.

Even if all fertilizer applications are cut back to maintenance levels, the concentration of phosphorus in soil solution would still, however, exceed the state water quality standard of 0.05 parts per million. John Hassett, soil chemist in the U.S. Department of Agronomy, has done recent work confirming this fact. At the 0.05 level in solution, the phosphorus attached to the soil would give a soil test level of around 13, which we think is quite low. We want to have a soil test of 40 to 50 to get maximum yields. This all makes me think that farmers will not be able to get acceptable yields if we say that the water draining out of their fields has to be less than 0.05 parts per million in phosphorus.

Coordinators Hired for RAC's

The Illinois EPA has recently hired coordinators to assist regional advisory committees (RAC's) in assessing local water pollution problems from agricultural lands, urban areas, construction sites, and mining areas, and to devise solutions to be included in the state's clean water plan.

RAC's are composed of local officials, representatives of special interest groups and regional planning commissions, and interested citizens. Coordinators are listed below as well as their geographic jurisdictions. Contact them for program planning assistance.

Statewide public participation coordinator:

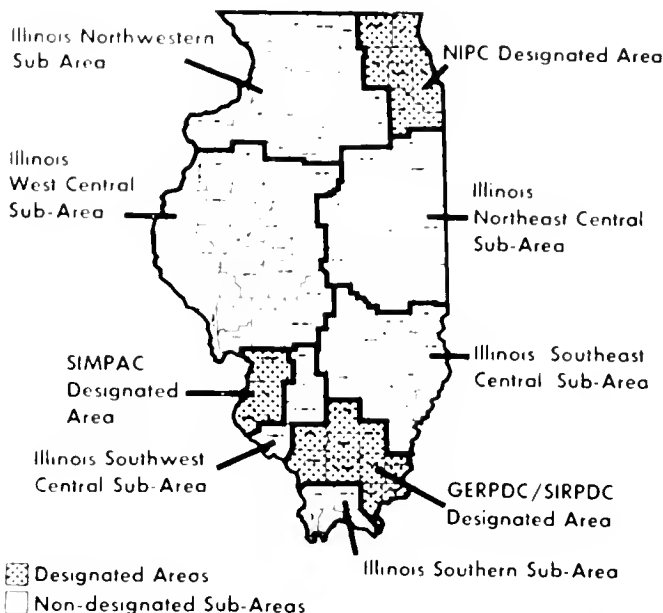
Chuck Kincaid
Illinois EPA
2200 Churchill Road
Springfield 62706
(217) 782-3362

Northwest subarea (*Boone, Bureau, Carroll, DeKalb, Grundy, Henry, Jo Daviess, Kendall, LaSalle, Lee, Marshall, Mercer, Ogle, Putnam, Rock Island, Stark, Stephenson, Whiteside, and Winnebago*)

Victor Crivello
Northwest Regional Council
210 E. Third
Sterling 61081
(815) 625-2243

West central subarea (*Adams, Brown, Calhoun, Cass, Christian, Fulton, Greene, Hancock, Henderson, Jersey, Knox, Logan, McDonough, Macoupin, Mason, Menard, Montgomery, Morgan, Peoria, Pike, Sangamon, Schuyler, Scott, Tazewell, Warren, and Woodford*)

Dawn Wrobel
Western Illinois Regional Council
P.O. Box 296
Macomb 61455
(309) 837-3911



CORRECTION. The subarea planning regions for "208" clean water planning outside the three designated regions in Illinois have recently undergone some jurisdictional changes. Subareas affected are the northwestern, northeast central, and southeast central regions.

Counties in the metropolitan Chicago area should contact Glenn Dirks at the Illinois EPA, (217) 782-3362, and metropolitan St. Louis counties should contact Mike Johnson at Southwestern Illinois Metropolitan and Regional Planning Commission in Collinsville, (618) 344-4250.

Northeast central subarea (*Champaign, Coles, DeWitt, Douglas, Edgar, Ford, Iroquois, Kankakee, Livingston, McLean, Macon, Moultrie, Piatt, and Vermilion*)

William Frerichs
Regional Office
2125 S. First
Champaign 61820
(217) 333-8361

Southeast and southwest central subareas (*Bond, Clark, Clay, Clinton, Crawford, Cumberland, Edwards, Effingham, Fayette, Jasper, Lawrence, Marion, Randolph, Richland, Shelby, Wabash, Washington, Wayne, and White*)

William Sullivan
South Central Illinois Regional Planning and Development Commission
107A S. Broadway
Salem 62881
(618) 548-4234

Southern subarea (*Alexander, Johnson, Massac, Peoria, Union, and liaison with Greater Egypt and Southeastern Illinois Regional Planning and Development Commissions*)

Robert Fox
2200 W. Main
Marion 62959
(618) 997-1371

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(Continued from page 1)

Sediment may carry:

- disease and infectious organisms;
- plant nutrients (phosphorus and nitrogen) which can cause eutrophication in water;
- some pesticides and heavy metals adsorbed on soil particles. Upon settling to the bottom, bottom feeding organisms may ingest these materials and store them in their body, leading to biological amplification in the food chain.

Deposited sediment:

- utilizes space that was built to store water;
- creates shallow water areas which support nuisance vegetation and detracts from the beauty of the lake;
- creates shallow areas making them unsuitable for power boating, swimming, and water skiing;
- will destroy many species of fish by covering bottom spawning and feeding areas;
- reduces the productivity of many species of aquatic organisms which provide fish and waterfowl food;
- may fill drainage ditches which affects both surface and tile drainage resulting in lower crop yields;
- may create navigation problems in many rivers unless dredged. Dredging costs over \$100 per cubic yard, and environmental damage may result from deposition of dredge spoils in backwater areas. The process of dredging also increases turbidity and destroys any organisms sucked up by the dredge;
- can increase the degree of flood damage.

Task Force Schedule

Each additional subcommittee to the Task Force (fertilizers, livestock wastes, pesticides, and forestry and fruit production) has submitted a comparable problem assessment to the Illinois EPA. These statements will be part of the total problem assessment sent to the USEPA in Illinois' clean water planning program.

By September the Ag Task Force will complete its recommendations for best management practices to improve water quality, and a final implementation report will be due in January 1978.

Forestry Symposium Set for October

A 208 Symposium on non-point sources of pollution from forested land is scheduled for October 19 and 20 at Southern Illinois University (SIU), Carbondale, said Gerald M. Aubertin, symposium organizer and chairman of the Ag Task Force's subcommittee on forestry and fruit production.

Primarily for professional and practicing foresters, the meeting is designed to explore such topics as forest soils, their properties, and potential impact on water quality; impact of forestry activities and practices on water quality; and best management practices for the production of forest products and high quality water. For more information contact Aubertin, Department of Forestry, SIU, Carbondale 62901 (618) 453-3341.

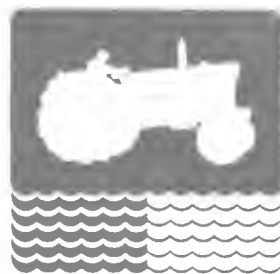
Robert D. Walker
Extension specialist
Natural Resources

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"208" Update for Agriculture

AGRICULTURAL ISSUES RELATING TO STATEWIDE WATER QUALITY PLANNING



Vol. 2, No. 1

July, 1977

Ag Problem Assessment: Pesticides and Fertilizers

How Much Do They Affect Water Quality?

Certain organochlorine insecticides and mercury are still contaminating Illinois waters even though they are now banned, according to the Ag Task Force's pesticides subcommittee.

In assessing pesticide problems that may be affecting Illinois water resources, the subcommittee said that DDT and dieldrin, as well as mercury from mercurial fungicides, are still problems because residues remain in the soil long after application is stopped. Soil particles can carry these residues to streams, lakes, and other bodies of water.

Current Pesticide Use

Pesticides now in use appear to create fewer problems for several reasons, said the subcommittee. Current pesticides may not magnify in the aquatic environment as readily, many are biodegradable, and the monitoring may not be adequate. More research is needed to determine the effect of pesticides in water and on aquatic organisms and on the disposal of pesti-

cide containers and rinse water from spray tanks, the subcommittee said.

Fertilizer Application and Water Quality

The proper use of fertilizer to meet crop needs should not cause a serious water pollution problem, according to the fertilizer subcommittee. It is possible, however, that some of the current use of fertilizer is higher than can be most efficiently utilized, and it is these excessive amounts that are most subject to leaching.

A major problem being studied by the fertilizer subcommittee is nitrates, especially from fertilizer, affecting public drinking water supplies. They have found that water supplies with a higher than average use of fertilizer do not account for the majority of the high level incidents in municipal water supplies, however. The subcommittee said that fertilizers are only one of several nitrogen sources, including rainfall and

(Continued on page 2)



Inside . . .

On-farm experiment of vegetative filter strip, page 3.

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Erosion Control Bill Passes Senate; Awaits Signing

H.B. 818 just passed the Illinois Senate, amending the existing Soil and Water Conservation Act, according to the Illinois Department of Agriculture. The amended version of the House bill provides for a voluntary compliance program affecting people involved in land disturbing activities.

According to Joe Berta, Ag Task Force member, the Department will assume responsibilities for developing state erosion control guidelines. Local Soil and Water Conservation Districts will then develop programs along these guidelines and set erosion standards at the local level. The bill awaits Governor Thompson's probable signature later this month.

Problem Assessment on TeleNet

No serious disagreement existed between ag problem assessment reports and citizen reactors, as over 30 counties participated in the second TeleNet program on statewide clean water planning and agriculture, according to Bob Walker, program coordinator.

Chairmen of the five subcommittees to the Task Force on Agricultural Non-Point Sources of Pollution briefly discussed their assessments of water quality problems caused by fertilizer and pesticide applications, soil erosion, livestock waste disposal, and forestry and fruit production.

Reactions to Assessment

Reactors to each report included a Vermilion County beef producer, Robert Bookwalter; a McLean County farmer, Herman Warsaw, who holds the world's record for corn yield per acre; a district forester, Grant Haley, Havana; the chairperson of the Winnebago County Soil and Water Conservation District Board, Eldora Zimmerman; and a fruit farmer, James Eckert, St. Clair County. Each reactor commented on the subcommittee report affecting his or her ongoing activities, and provided important citizen input to this initial stage in the clean water planning process.

While no real disagreements emerged, Warsaw, in discussing statements made by the fertilizer subcommittee, said that he did not believe that excessive application of fertilizers was really as great a problem as described. He said the cost of fertilizer made it prohibitive for any farmer to apply more than needed.

Bookwalter said that most livestock runoff problems were being caused by feedlots that had been designed and constructed before EPA regulations controlling pollution had been passed.

Zimmerman was concerned with the level of erosion described in that subcommittee's report and said that the problem was really one of farmers taking very seriously their role as voluntary stewards of the land.

Future TeleNets

TeleNet is a statewide telephone network with stations located in every Extension region in Illinois. The network is operated by the U.I. Cooperative Extension Service.

Future TeleNet programs on water quality will be held later this fall when the Ag Task Force subcommittees will report their recommendations for best management practices to control some ag-related water pollution problems. The Ag Task Force is serving as an advisory body to the Illinois EPA which is responsible for submitting a statewide water quality planning program to the federal government in 1978.

(Continued from page 1)

decomposition of organic matter, that provide inputs to the soil.

If problems do occur from nitrogen fertilizer applications, they are likely to come from excessive application rates or improper timing of application, rather than from the proper and necessary use of fertilizer to achieve necessary yields. For example, during the winter any excess nitrate nitrogen would be subject to leaching when the ground thaws and subject to runoff if applied on frozen ground.

Unlike nitrogen, which in large measure leaves the soil system in solution, most phosphorus lost from agricultural soils is attached to soil colloids and is lost as a consequence of soil erosion. However, the amounts lost in solution, even though small, are often enough to exceed the 0.01 mg/l level critical to algal growth. Water flowing in streams is usually not subject to excessive plant growth; most problems occur in standing water, according to the subcommittee.

Not Only Agriculture's Problem

Although the use of chemical fertilizers and sewage sludge to maintain productivity can affect water quality, the problem of water pollution by plant nutrients will not be solved by agriculture alone, said the subcommittee. Neither hopes, ideals, soil conservation practices, nor laws and regulations can prevent phosphorus from being on soil colloids or prevent nitrogen from being released by the decomposition of organic matter, the subcommittee concluded.

Task Force Schedule

Each additional subcommittee to the Ag Task Force (soil erosion and sedimentation, livestock waste, and forestry and fruit production) has submitted a comparable problem assessment to the Illinois EPA. These statements will be part of the total problem assessment sent to the U.S. EPA in Illinois' clean water planning program.

By September the Ag Task Force will complete its recommendations for best management practices to improve water quality, and a final implementation report will be due in January 1978.

THE VEGETATIVE filter strip, a method of managing feedlot runoff and described in the April-May 2008 *Update*, is getting a real on-farm test.

A beef operation near Big Rock in Kane County, averaging about 500 cattle and owned by Lawrence Strope of Aurora, is the site for a 2,000-foot filter strip encompassing three to four acres.

A vegetative filter strip waste disposal system consists of rainfall runoff being collected and immediately spread over grassed areas after passing through a small settling basin.

According to Merwyn Ness, who manages the Strope farm, the waste disposal system is necessary to the lawful survival of their beef-producing enterprise, as the farm is located overlooking Big Rock Creek, and runoff from the feedlots, without the strip, would go directly into the stream.

The water that eventually reaches Big Rock Creek after passing through the strip is low in all forms of nitrogen, as well as most other nutrients, according to preliminary water quality tests.

Ness said that the amount of wastes the strip must assimilate is large enough that the three-foot wide channel suffers from fertilizer burn, especially at the beginning of the strip where the wastes are most concentrated. Grasses are beginning to fill the strip near its end, however, and Ness said that perhaps a wider spreading pattern might help distribute the runoff more evenly over the total grassed area.

Strope and Ness have been cooperating in this research, conducted by the U.I. Department of Agricultural Engineering, for nearly two years at the suggestion of John A. Killam, Illinois Livestock Association



STRIP SUFFERS BURN. Merwyn Ness, who manages a cattle-feeding operation near Aurora, points out the lack of vegetation on the filter strip because of fertilizer burn.

and Ag Task Force member. Primary costs of the strip have been borne by the U.S. EPA, the Illinois Institute for Environmental Quality, and the U.I. Agricultural Experiment Station. Strope also provided 15 percent of the project on a cost-share basis.

Filter Stripping on the Farm



TRAPPING TECHNIQUE. Settling basin traps wastes from the 500 head feeding operation before passing runoff to the filter strip.

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Soil Losses for Carlyle and Shelbyville

According to recent Illinois State Water Survey reports, the Lake Carlyle watershed is losing 4.61 tons of soil per acre per year and Lake Shelbyville, 3.72 tons per acre per year.

Based on a 1971 survey by the U.S. Army Corps of Engineers, Lake Carlyle has trapped about 1,186 acre-feet per year of sediment in the first four years of reservoir operation. This means that of the erosion occurring in the watershed, 35 percent of the soil loss ends up in Carlyle, said Ming T. Lee of the Water Survey. No comparable figures are available for Lake Shelbyville sedimentation, he said.

Average annual soil loss rates are just one of the areas being studied on the two watersheds. The Water Survey will also assess the possible alternatives to control erosion and evaluate impacts to sediment yields in the two reservoirs.

Both Carlyle and Shelbyville are part of the larger Kaskaskia River Basin; Carlyle draining more than twice (2,680 square miles) what Lake Shelbyville drains (1,030 square miles).

Using the universal soil loss equation for estimating soil erosion and data from the *Conservation Needs Inventory*, the Survey found that Shelbyville exhibits the typical effects of intensive cropping: over 90 percent of the land is in cropland and approximately 90 percent of the erosion in the drainage area comes from cropland.

Not so typical are figures from the Carlyle Reservoir where cropland only accounts for 79 percent of the total land use and 64 percent of the erosion. Woodland also contributes significantly to erosion, as well as the greater overall sloping character of the land in the Carlyle watershed.

Upcoming Conference on "208" and Forestry

The impact forestry activities have on the quality of water in the nation's streams and the effect of future legislation on the forestry industry will be the topics of a special "208" Symposium on Non-Point Sources of Pollution from Forested Land, Oct. 19-20 at Southern Illinois University, Carbondale.

G. M. Aubertin, forestry professor and symposium organizer, said the program has three main goals: to define problems relating to non-point pollution from forestry activities, to consider possible solutions, and to discuss the potential impact of PL 92-500 on the individual landowner and the forestry industry.

The symposium will be held in the SIU Student Center. Registration is \$30. Additional information is available from Aubertin at the Department of Forestry, Southern Illinois University, Carbondale, Illinois 62901, (618) 453-3341. Attendance will be limited to 300 persons.

WATER POLLUTION FOR AGRICULTURE is published monthly by the Cooperative Extension Service of the University of Illinois at Urbana-Champaign for agricultural and environmental leaders in the state. It is supported in part with funds provided by the Illinois Institute for Environmental Quality. Robert D. Walker, project leader, c/o L.L. Moorhead, editor, *Ecology* and *Conservation* are selected and should be sent to 350 Mount Hall, Urbana, Illinois 61801 (217) 333-1130.

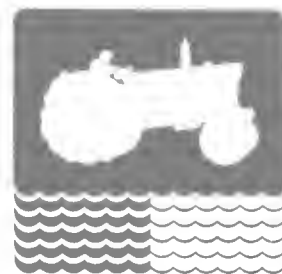
Robert D. Walker

Robert D. Walker
Extension specialist
Natural Resources



"208" Update for Agriculture

AGRICULTURAL ISSUES RELATING TO STATEWIDE WATER QUALITY PLANNING



Vol. 2, No. 2

August-September, 1977



Ag Assessment: Livestock Waste, Forestry and Fruit

Management Is Key to Waste Disposal

Livestock waste disposal presents a potential pollution hazard in Illinois, although there is no evidence that livestock wastes cause widespread water pollution now, according to the livestock waste subcommittee's problem assessment. The report said that management is the key to feeding cattle while maintaining water quality.

The subcommittee said the incidence of water pollution from livestock waste depends on the type of livestock facility and factors such as size of operation, the distance located from streams, and management practices used. According to the assessment report, monitoring potential pollution sources is difficult in Illinois because of the scope of livestock production in the state.

Open Feedlots and Pasturing

Open feedlot operations can present pollution hazards if located near a stream and if runoff is uncontrolled, the subcommittee said. The major water pollutants from

animal manures are oxygen-demanding matter, primarily organic; plant nutrients; and infectious agents. Color and odor are potential pollutants of secondary importance.

Research in other areas studied by the subcommittee indicates spreading manure at excessive levels or on sloping, frozen ground may constitute a pollution hazard, but management practices such as waste incorporation can reduce this pollution potential. Under some conditions land application of manure may actually reduce pollution.

Livestock raised on Illinois pastureland do not present a major threat to water quality, the subcommittee said. Overstocking pastures or direct stream access by large numbers of animals may create isolated cases of water pollution, however.

Milkhouse and milking parlor wastes and poultry

(Continued on page 2)

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IEPA Reviews Ag Problem Assessment

There are no clear statements by any of the Ag Task Force subcommittees that ag water quality problems are diminishing or increasing in size, said representatives of the Illinois Environmental Protection Agency (IEPA) in a critique of the Ag Task Force problem assessment.

The agency, in completing its critique of the report submitted in May, said that the assessment does not place ag pollution problems in an historical context. The reports also lack a geographic specificity, said James E. Frank, agriculture advisor to the IEPA and Ag Task Force chairman, who presented the critique.

Geographic Specificity

Frank said that it is important to know what counties, regions, watersheds, bodies of water, or other geographic subdivisions of the state have the worst problems and which ones are not affected by various agricultural practices.

Listing problems by priority of most severe to least severe is also important, and this is missing from the

reports, too, said Frank in summarizing the IEPA's critique at the July Task Force meeting in Urbana.

Specific Weaknesses

Among remarks addressed to individual subcommittee reports, the IEPA would like the soil erosion and sedimentation subcommittee to answer the question of whether tolerated soil losses set by the Soil Conservation Service ("T" values) are compatible with water quality goals.

Frank said that while the agency recognizes that several assumptions have to be made in order to answer this question (delivery rates, for instance), they believe the exercise is worth completing.

The IEPA would also like an attempt to be made to calculate how much of the pastured livestock in Illinois has direct access to streams, according to their critique.

The agency questioned the fertilizer subcommittee's conclusion that nitrogen fertilizer application at a certain economic agronomic rate does not adversely affect water quality or that the impact is a small price to pay for maximum crop production.

Perhaps BMP's (best management practices) should consider something less than optimum crop production and develop strategies to recover lost revenues through other means, said the IEPA critique.

Fate of Critique

Coordinators of the Regional Advisory Committees, who are involved in statewide clean water planning, and IEPA staff involved in water quality planning reviewed the Ag Task Force problem assessment.

The IEPA is requesting that Task Force subcommittees consider the critique, as well as those to be written by the Technical Advisory Committee, the Statewide Policy Advisory Committee, and the Regional Advisory Committees. The agency would like a response in the form of a supplemental problem assessment addressing these issues or stating reasons for not responding. These are to be submitted along with the BMP report due September 30, according to Frank.

(Continued from page 1)

water overflow have high pollution potential if direct discharge exists. The report noted, however, that direct discharges from these sources are not common in Illinois, and operators are correcting these problems as they build or remodel facilities.

Silage leachate—liquid discharge from open silos—can create water quality problems if allowed to reach surface or ground waters, according to the report. Again, the report said that assessing the prevalence of the problem is difficult, but instances of direct water contamination with silage leachate are believed to be relatively rare.

Forestry Management Practices

The forestry subcommittee concluded that the severity of forestry's impact is also related to manage-

IAA's Nelson Replies to IEPA Critique

"The Illinois Environmental Protection Agency (IEPA) appears to be directing the work of the Agriculture Task Force, and this disturbs us," said Morris E. Nelson, Illinois Agriculture Association and Ag Task Force member, in response to the IEPA's critique of the Ag Task Force problem assessment.

The IEPA is requesting answers where there are no answers, according to Nelson. He questioned the purpose of the IEPA critique and said that the assumptions that the Agency wanted subcommittees to make could not be made honestly.

Research data is not available about the relationships between soil erosion and delivery rates to streams, or fertilizer use and water quality, said Nelson.

"Will the BMP's (best management practices) we are being asked to develop really help us meet the intent of P.L. 92-500 (the Water Quality Act Amendments of 1972)?" he asked.

James E. Frank, agriculture advisor to the IEPA and chairman of the Ag Task Force, said that the agency does not want to accomplish "progress by confrontation." He said that he believed BMP's could help attain the goal of "fishable, swimmable waters wherever attainable."

"Some members of environmental interest groups really believe that there is a tendency for this task force, because of its membership, to minimize agricultural problems," said Daniel J. Goodwin, IEPA program manager for clean water planning.

We are asking for a complete definition of the problem or at least ideas about where we need to concentrate additional research, he said.

ment skills employed in forestry operations. Bad management may result in water quality degradation; good management in clean water.

According to the subcommittee's report, there are four general changes which may take place in a body of water due to man and his activities in a forest: (1) an increase in suspended solids, (2) an increase in water temperature, (3) an increase in the nutrient load, and (4) an increase in the level of organic matter carried by or contained in the water flowing within or out of the forest. All four can be considered possible pollutants.

The most widespread water quality problem associated with forestry activities in Illinois is an increase in the suspended solids or sediment load carried by streams draining harvested areas. The source of sediments is soil erosion associated with site disturbance from building logging roads, skid trails, and log landings. If these are improperly located, constructed, used, or maintained, they can have an adverse effect on stream quality.

Local Impacts: Severe

The subcommittee said that overall water quality degradation in Illinois due to forestry activities appears to be relatively small, according to available data. Locally, however, the impact may be severe and may even result in a major change in aquatic life and water quality in the affected stream. For instance, the increased sediment or nutrient load in a stream caused by a logging operation, although eventually diluted and obscured, does add to the total load in the affected stream.

In general there are only three forestry activities which tend to produce large quantities of sediment, said the subcommittee. They are the method by which forest products are removed from the watershed, conversion of a forested area to other use, and livestock grazing.

Little Problem From Fruit

The fruit production subcommittee concluded that fruit growing in Illinois is insignificant as a potential source of non-point pollution. The report states that (1) apple and peach orchards occupy less than 16,000 acres of Illinois cropland, (2) continuous sod cover is maintained in most orchards, reducing erosion problems, (3) relatively small quantities of fertilizer are used on orchards, (4) currently used pesticides have a relatively rapid breakdown, and (5) most fruit growers generally follow instructions on pesticide application.

On an individual watershed, as is the case with forestry, problems might be significant, however, the subcommittee report said.

Task Force Schedule

Each additional subcommittee to the Task Force (fertilizers, pesticides, and soil erosion and sedimentation) has submitted a comparable problem assessment

	1972	1973	1974	1975
<i>Number on farms December 1 figures given in thousands</i>				
Hogs and pigs...	6,650	7,350	6,500	5,600
Kept for breeding...	961	992	800	823
Market hogs and pigs	5,686	6,358	5,700	4,777
	1973	1974	1975	1976
<i>Number on farms January 1 figures given in thousands</i>				
Cattle and calves...	3,240	3,250	3,200	3,400
Cows and heifers calved...	1,090	1,110	1,125	1,086
Milk cows...	280	265	257	244
Beef cows...	810	845	868	842
Heifers 500 pounds and over	602	570	531	613
Milk cow replacements...	90	90	93	91
Beef cow replacements...	123	130	144	139
Other...	389	350	294	383
Steers 500 pounds and over	680	674	640	807
Bulls 500 pounds and over	51	52	63	68
Heifers, steers and bulls under 500 pounds...	817	844	841	826

Source: Illinois Agricultural Statistics Annual Summary 1976, Illinois Cooperative Crop Reporting Service.

LIVESTOCK PRODUCTION FIGURES. An inventory of hogs, beef, and milk cows gives some indication of waste disposal problems facing livestock producers in Illinois.

to the Illinois EPA. These statements will be part of the total problem assessment sent to the USEPA in Illinois' clean water planning program.

By September the Ag Task Force will complete its recommendations for best management practices to improve water quality, and a final implementation report will be due in January 1978.

Governor Signs Soil Erosion Bill

Governor James R. Thompson earlier this month signed H.B. 818, the Soil Erosion Control Bill, which amends the Soil and Water Conservation Districts (SWCD) law.

The new law provides for the Illinois Department of Agriculture to design erosion and sedimentation guidelines in a voluntary conservation program. Local districts will use the guidelines for setting soil erosion standards and for developing their own erosion programs.

Soil Loss Reassessment

According to Kay Whitlock, ag engineer, Illinois Department of Agriculture, the guidelines, when developed later this year and next, will include a complete reassessment of soil loss tolerances for each soil type in the state. New erosion research, she said, will be studied in order to present a state of the art evaluation of erosion prediction.

The guidelines will be drafted as an optimal solution for controlling erosion and maintaining soil productivity.

(Continued on page 4)

Survey results of "Pesticide Use by Illinois Farmers, 1976" available. Contact Illinois Cooperative Crop Reporting Service, P.O. Box 429, Springfield 62705.



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USEPA Non-Point Sources Chief Featured Speaker at Forestry Symposium

Joseph A. Krivak, chief of the non-point sources branch of the water quality planning division, U.S. Environmental Protection Agency (USEPA), will be a featured speaker at the "208" Symposium on Non-Point Sources of Pollution from Forested Land, Oct. 19-20 at Southern Illinois University, Carbondale.

According to G. M. Aubertin, S.I.U. professor of forestry and symposium coordinator, Krivak will dis-

(Continued from page 3)

ity, Whitlock said. SWCDs will have the opportunity to use the guidelines as a tool in reviewing their local plans.

The Soil Conservation Service, Illinois Agricultural Experiment Station, Cooperative Extension Service, and the USDA's Agricultural Research Service will advise the Department in writing the guidelines.

Erosion Control Implementation

While the law is based on voluntary compliance, cost-sharing programs will encourage cooperation, said Whitlock.

The SWCDs are also the sponsoring agencies for federal flood control programs, and many municipalities will want to become part of a district to take advantage of this federal funding.

Public hearings will be held to review all Department erosion guidelines. The governor is also appointing a state soil and water conservation districts advisory board with seven members: five farm operators and two ex officio members, the director of the Department of Agriculture and the director of Extension, University of Illinois College of Agriculture, to advise the Department in developing the erosion and sediment program.

cuss the economic and political considerations of "208" planning, especially as they relate to agricultural and silvicultural production.

Krivak, who is involved in setting national policy and program direction for non-point pollution control, will also describe the new proposed amendments to P.L. 92-500 (the Water Quality Act Amendments of 1972), and where water quality planning appears to be going at the federal, regional, and state levels.

Previous to his appointment with the USEPA, Krivak worked in the Department of Interior and the Soil Conservation Service.

The symposium will be held in the S.I.U. Student Center and registration is \$30. Additional information is available from Aubertin, Department of Forestry, S.I.U., Carbondale 62901 (618) 453-3341. Attendance will be limited to 300 persons.

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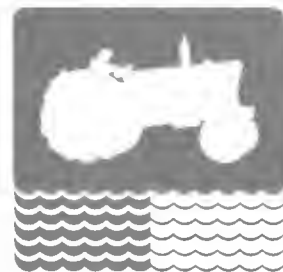
Robert D. Walker

Robert D. Walker
Extension specialist
Natural Resources



"208" Update for Agriculture

AGRICULTURAL ISSUES RELATING TO STATEWIDE WATER QUALITY PLANNING



Vol. 2, No. 3

October, 1977

Task Force Work on Management Practices

Recommendation of Best Management Practices (BMPs) is the next big job awaiting the attention of the Task Force on Agricultural Non-Point Sources of Pollution. The assessment of water pollution problems linked to agriculture is now virtually complete.

A BMP has been defined this way by the Federal Environmental Protection Agency:

... a practice or combination of practices that is determined by a state after problem assessment, examination of alternative practices, and appropriate public participation, to be the most effective, practicable (including technological, economic and institutional considerations) means of preventing or reducing the amount of pollution generated by non-point sources to a level compatible with water quality goals.

The EPA definition suggests the following criteria for a BMP:

1. management of pollution generated by non-point source;
2. achievement of water quality standards compatible with water quality goals;
3. effectiveness in preventing or reducing the amount of pollution generated;
4. practicability.

BMP Recommendation Underway for Soil Erosion

Sedimentation is a major water pollution problem in Illinois according to the Task Force's soil erosion and sedimentation subcommittee. Subcommittee members also agree that effort should be concentrated on keeping soil in place, rather than on collecting and treating it after it has entered a water supply.

In trying to develop BMPs, the subcommittee first considered the test-proven soil conservation practices, those known to be effective in keeping soil in place. Conservation tillage, contour farming, contour strip farming, terracing and crop rotation all work.

But a single soil conservation practice will seldom solve all the problems which may exist on a given farm. More often several practices should be combined depending on soil type, steepness of slope, the farmer's own goals, and the type of farming operation in question.

The most difficult problem the subcommittee faces is how to determine which, if any, BMPs will actually achieve water quality goals. There is little research to support such a decision. But committee members believe that each farm will likely need a best management system which will include a number of BMPs.

Erosion Control Not a Panacea

Eroded soil carries other polluting substances with it when it enters a water supply, substances such as pesticides, fertilizers, and organic matter. So it is widely assumed that if soil erosion is controlled, other water pollution problems will also be solved. Evidence suggests, however, that even if soil erosion were reduced to a level generally recommended, problems with nitrogen, phosphorus, and some pesticides would continue.

The soil erosion subcommittee of the Task Force will make the clearest statement it can concerning BMP's. But a well-developed monitoring system will have to be put into effect for several years before the effectiveness of BMP's can be finally evaluated.

Fertilizers Subcommittee Tentatively Recommends No New Rules

Those farmers who are apprehensive about possible new controls they may face as a result of the work of the 208 Task Force should take heart from the conclusions reached to date by the subcommittee studying fertilizer use.

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The subcommittee opened its preliminary report on best management practices by saying it "...has not found evidence linking the farm use of fertilizers directly with adverse effects on water quality sufficient to warrant the regulation of fertilizer use."

The report will be written in its final form soon. But its early draft suggests that it will amount to a list of

suggestions for farmers to add to their existing individual farm plans. Those suggestions will be aimed at assisting the farmer in avoiding overfertilization and nutrient loss.

The preliminary report makes it clear, however, that fertilizer use should continue to receive careful study as a potential pollutant.

Other Subcommittees Near Final BMP Reports

Following the presentations of preliminary BMP reports at the September task force meeting, each group met to review the comments of task force members and to finalize the language of the finished report.

Each subcommittee reserves the right to alter its BMP report if new or different information becomes available, but generally speaking, the preliminary reports are a fairly accurate reflection of what can be expected in the final reports.

Land Application of Manure Receives Continued Endorsement

The subcommittee on livestock waste says in its September report that the land application of manure is an "acceptable and environmentally sound practice when conducted in a responsible manner." The report also notes that land application is, virtually without exception, the most economically advantageous method of waste disposal.

In outline form, the preliminary report of the subcommittee dealt briefly with the gamut of livestock feeding situations. In most cases, the group based its recommendations on the 1977 *Illinois Agronomy Handbook*, and the IEPA's *Design Criteria for Field Application of Livestock Waste*. The subcommittee has also made tentative recommendations for the control of runoff from open feedlots and pasture production facilities—subjects not treated in the publications mentioned above.

Attention was also given to silage leachate and to private home sewage systems.

The group noted that a more thorough discussion of the effectiveness, management problems, cost, adaptability, and flexibility of each recommended practice will be included in its final report.

New Monitoring Board Recommended by Pesticides Group

The major recommendation in a lengthy preliminary report by the pesticides subcommittee calls for the establishment of a permanent Illinois Pesticides Monitoring Advisory Board. The subcommittee suggests that such a board be created by, and be responsible to, the state's Interagency Committee on Use of Pesticides.

In presenting the tentative report of his subcommittee, chairman William Luckmann expressed some impatience with continued research aimed at determining the presence in the environment of residues from the now-outlawed organochlorine insecticides, particularly DDT and dieldrin. The rough draft subcommittee report urges that greater research attention be paid to the currently popular insecticides and herbicides.

The subcommittee did not make recommendations regarding disposal of either containers or dilute rinsate, but indicated that current work in those areas may make it possible to name best management practices in the foreseeable future.

Site Disturbance Principal Focus of Forestry Subcommittee

"Generally, logging roads are the most ubiquitous, most permanent man-induced features of logged areas. Once constructed, they are there and they may affect the area for years henceforth." Accordingly, the bulk of the forestry report to the September task force meeting dealt with BMPs for the removal of forest products from the watershed. Some special attention was given to the construction, location, maintenance, and retirement of logging roads.

In its fairly detailed report, however, the subcommittee also discussed a host of management practices that owners and users of land must evaluate on a site-by-site basis.

Soil Erosion, Nutrients, and Pests Management Concerns of Fruit Producers

The subcommittee on fruit production directed its report toward the related problems of soil erosion, nutrient loss, and pest management.

With regard to soil erosion, the subcommittee gave major emphasis to continuous sod cover. Contouring and terracing were also endorsed in some detail.

Ideas on soil erosion control combined with recommendations for minimum necessary fertilization were offered as ways to combat nutrient losses.

The group also offered nearly a dozen suggestions for pest management. Those tentatively recommended practices included means of avoidance, eradication, and exclusion.

Some Thoughts on BMPs and Money

208 Task Force members have not forgotten about practicality. The time for a long hard look at the cost of what they are recommending is coming soon.

Members are quite aware that any recommended changes in agricultural practices are likely to translate directly into dollars. How many dollars and where those dollars will come from will figure prominently in the final decision-making process.

But Task Force Chairman Jim Frank, of the Illinois Environmental Protection Agency, urged members in September to consider best management practices on their own merits, for the time being, and weigh the benefits against the costs later. Frank said: "Let's not fix ourselves into what we anticipate will be the economic benefits when the institutional framework comes out. Let's leave the BMPs fairly broad if possible, and then screen them out later as the economics comes out between now and February."

Frank acknowledged that this approach has its potential problems. He put it this way: "I admit there's a bit of danger in it, because when . . . everyone gets comfortable talking about the practice only, it's awfully easy to kind of push the economics aside and then slip it in later."

But Frank added that he trusts the judgment of the task force members and doesn't expect that sort of oversight.

Recommended best management practices should be written in their near-final form by the end of October. The following stage of the task force's work is informally titled "Institutional Arrangements." The discussion of institutional arrangements will center on how and by whom any new rules and regulations should be administered.

At that point, the real dollars-and-cents reckoning will have to be done.

208 Television Coverage Planned

Over the remaining months of the life of the 208 Task Force its various conclusions and recommendations will be covered in a series of television reports to be distributed to stations throughout Illinois, and to other stations bordering the state. The reports will be of news story length (*i.e.*, short!) and will attempt to explain the task force's work and why that work will be important to all Illinois citizens, both on and off the farm.

The television service will be paid for, in part, with funds from the Illinois Institute for Environmental Quality. Stories will be produced by personnel of the UI College of Agriculture's Office of Communications.

If you have story ideas — items which represent significant impact, general interest, and which could be made visually interesting — send your suggestions to Bob Walker, 330 Mumford Hall, Urbana, IL 61801, or to Grear Kimmel, 69 Mumford Hall.

TeleNet Program Devoted to BMPs

On December 20th, at 9:30 a.m. subcommittee chairmen of the 208 Task Force will discuss the BMP recommendations of their respective groups on the TeleNet network of the UI Cooperative Extension Service.

The program will be offered to all TeleNet stations. Contact your County Extension Agriculture Adviser for the location of the station nearest you which will carry the program.

Farmers Surveyed about Soil Erosion Controls

Little correlation has been established between types of farmers, farming techniques, and attitudes towards soil erosion control strategies, according to a recently completed survey of Illinois farmers.

Wesley D. Seitz, associate director of the University of Illinois Institute for Environmental Studies, and David M. Gardner, U.I. College of Commerce and Business Administration, who were co-leaders on the project, said some of the most effective conservation practices were considered by a majority of the respondents as very unfair to implement.

Conservation Plan Requirement

Seitz said that a particularly interesting finding was that 39 percent of the farmers who currently have a conservation plan perceive requiring a plan as very unfair to those who do not have one. Of the farmers responding, 40-60 percent would not implement a required plan even if they were punished.

Policies such as cost sharing, tax credits, and loans were considered fair or somewhat fair by the majority of farmers. Outlawing fall moldboard plowing was considered unfair by 70 percent.

The survey, which was conducted last summer, included questions about 17 different policies. Questions were designed to determine a farmer's perceived fairness of each of the policies, the groups that would be unfairly treated by each policy, the likely rate of adoption of each policy, and the general experience and attitudes toward soil conservation.

Survey of 11 Counties

Farmers from 11 counties were chosen to complete the survey and of 135 contacted, 87 replied. Agricultural Stabilization and Conservation Service executive directors in the counties were also interviewed.



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Mercury Revisited

UI Plant Pathologist M. C. Shurtleff took strong exception to a statement in Vol. 2, No. 1 of this newsletter. We've rechecked the facts and have found that Shurtleff's objection is quite warranted.

In the article "A Problem Assessment: Pesticides and Fertilizers, How Much Do They Affect Water Quality?" we said: "In assessing pesticide problems that may be affecting Illinois water resources, the [Pesticides] subcommittee said that DDT and dieldrin, as well as mercury from mercurial fungicides, are still problems because residues remain in the soil long after application is stopped." That statement is a misrepresentation of the Pesticides Subcommittee's report. Our apologies are offered, and we hasten to correct the error.

Mercury is quite different from DDT and dieldrin and they should not have been equated. In its Problem Assessment Report, the subcommittee said: "Some of the persistent organochlorine insecticides, especially DDT and dieldrin, have in the past, and are currently contaminating water and aquatic organisms. With the insecticides, contamination is due to residues persisting in the soil from previous use. Mercury is also a contaminant, but the source of contamination from mercury is unknown."

It's Everywhere

Mercury is a naturally occurring element found in air, water, soil, wood, coal, oil, and other substances. In the atmosphere, it is found in raindrops and in smoke from burning coal and oil. Dr. Shurtleff points out that soils that have been in forest or native prairie vegetation since before the arrival of white settlers on the continent have as much or more mercury than soils planted in small grain for 100 years and treated in the past with mercury fungicides.

With the single exception of protecting golf course greens and tees from snow mold fungi, the UI College of Agriculture has not recommended the use of mercury in any form, for any purpose, since 1970-71. But the college's Plant Pathology Department has applied both organic and inorganic mercury compounds to some replicated turf test plots for 7 consecutive years — an average of more than 20 applications per year — and found it difficult to detect more mercury in the test plots than on the check plots.

Robert D. Walker

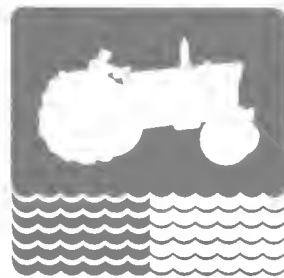
Robert D. Walker
Extension specialist
Natural Resources

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"208" Update for Agriculture

AGRICULTURAL ISSUES RELATING TO STATEWIDE WATER QUALITY PLANNING



Vol. 2, No. 4

November, 1977

Cost Sharing: USEPA Officials Encouraging

Two officials of the U.S. Environmental Protection Agency (USEPA) say that Congress understands the 208 money message and is prepared to commit large sums for sharing the costs of land-use changes or improvements that might be necessary to meet new water quality standards resulting from the 208 planning process.

The 208 symposium held on the Southern Illinois University campus October 19 and 20 was the occasion for the good news. George Alexander, Jr., Regional Administrator of Region V USEPA, opened the meeting with an "administrator's-eye" view of the planning process. Alexander spoke emphatically of the need for federal financial assistance in implementing best management practices likely to be recommended.

The final money decisions, of course, will come from Congress, and nothing is definite now. But Alexander said he thinks Washington is preparing to spend \$200 million, then \$400 million over the first two years of new enabling legislation.

In making the case for federal assistance, Alexander cited the example of the farmer who takes cropland out of production to plant grass waterways. He said the benefits to the landowner are "nowhere near" equal to the cost of taking the land out of production. But, he

said, the benefits to society are important enough that everyone should help pay.

Joseph Krivak, the Chief of the Non-Point Source Branch of USEPA's Water Planning Division, told the Carbondale group that he anticipates the same congressional commitment to 208 BMP cost-sharing: \$200 million in fiscal 1979 and \$400 million in fiscal 1980.

Voluntary vs. Regulatory Approach Depends on Who's Talking

But another big question remains for the people who may be affected by a finished 208 plan: What approach to implementation will state and federal governments take? Will they go along with a program that relies largely on voluntary cooperation on the part of land-users, or will they insist on a program of strict legal enforcement?

In Carbondale, both Alexander and Krivak said they expect non-regulatory programs to be widely accepted as a workable way to implement 208 programs. Both emphasized the importance of state and local input into the development of those non-regulatory programs. Alexander and Krivak said that USEPA does not presume to know what will work in any given area. Krivak said a "lack of state and local input would almost guar-



CHEMICAL CAN COLOSSUS

You say you have trouble knowing what to do with the chemical cans generated by your farm each season? Think about trying to dispose of 400,000 of them. More on page two.

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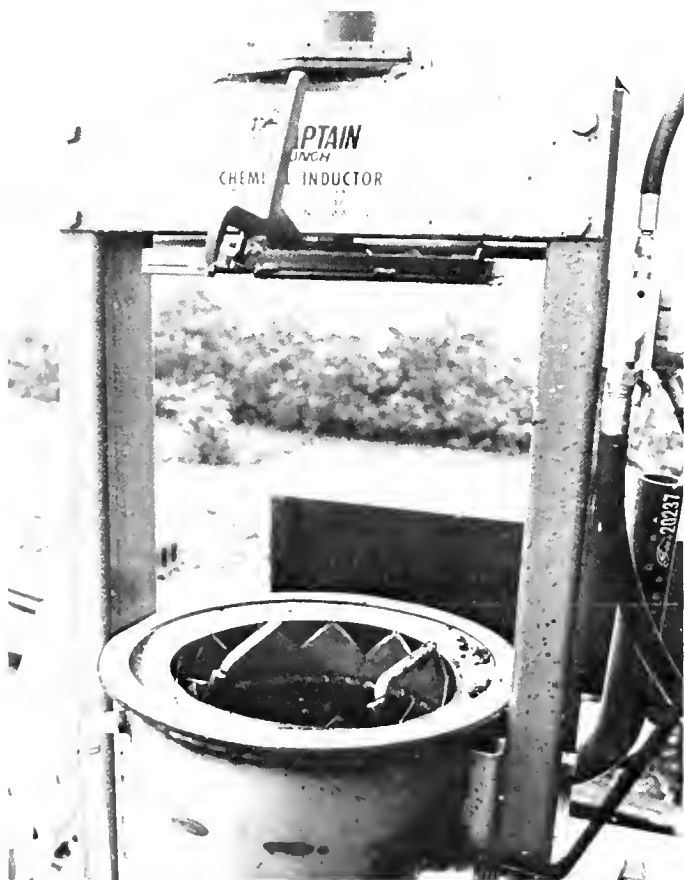
A GOOD IDEA ... FINALLY

Since many of these cans collected from across Illinois in 1976 had not been rinsed, the collector had trouble finding a buyer for the scrap, and the Illinois EPA wouldn't allow them to be moved. Recently, a permit was issued for the cans to be rinsed and crushed at the site, with rinse water to be trucked to an approved landfill.



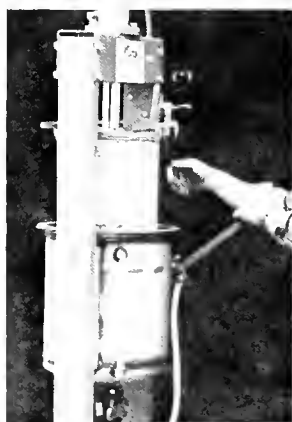
THREAT TO WATER QUALITY?

In the meantime, rainwater comes and goes. The Sangamon River is downslope, a short distance away.



NEW DISPOSAL TECHNOLOGY

There are now several machines available which will empty a can, pump it into a mix tank, then rinse the can. Other machinery will crush the can into a more manageable size and shape. This one, called *Captain Crunch*, combines all three operations.



JUST PUT IN THE UNOPENED CAN ...

which is then forced onto stainless steel blades. The bottom of the can is cut out, and the interior is spray rinsed.



THEN COMES THE CRUNCH

Before the user handles the can again, it is compressed into about 20% of its original size.



THE FINAL PRODUCT ...

is far less cumbersome than the can in its original condition. Rinsed, the crushed can should be acceptable to any landfill operator, or it can be recycled.

antee unworkable programs and failure." Alexander stressed the same point: "The purpose of 208... is to allow the decisions that affect local and regional water quality to be made by the public that's affected by it." He said that in reviewing 208 implementation program proposals "... we're going to be very flexible."

But 208 task force members loudly expressed their displeasure when Noel Kohl, the Chief of the USEPA Region V Illinois Planning Section, made it clear at their October meeting that he expects the 208 planning process to result in government regulation.

Kohl said he thinks that federal law was written to mean that non-point sources of pollution must be controlled by new government regulations.

Where we've got a water quality problem, we need to come up with a management approach. This management approach has got to have adequate legal authority or adequate regulatory powers. This is kind of an area of contention, whether we ought to go voluntary or regulatory. But the law specifies that we do come up with a regulatory program if we have a problem.

At the same task force meeting, Kohl showed two slide presentations designed to explain the federal approach to managing non-point sources of water pollution. The presentations were roundly criticized by task force members for their lack of any mention of the possibility of correcting water quality problems with

voluntary measures such as the promotion of best management practices.

USEPA Prepared to Go Either Way?

Task force Chairman Jim Frank, of the Illinois Environmental Protection Agency, may have summed up the apparent discrepancies in federal thinking when he said:

I feel they [USEPA] are leaving themselves an out... so that depending on what some of the first plans look like—depending on what the political winds are blowing—they can jump on either side, or sometimes on both sides of the fence.

Task force members, many of whom are farmers or are otherwise engaged in agricultural business, are generally inclined to favor the voluntary approach to implementing the state's final 208 plan. They feel that way because no existing data can prove that any specific changes in agricultural practices will correct water quality problems.

Task Force members have said that any recommended changes in farm practices should be viewed as experiments to be evaluated over time, and that regulatory measures might follow more reasonably if such an evaluation can prove that a specific change does, in fact, correct or improve water quality problems.

29 States Send Reps to 208 Symposium at SIUC

The recent Symposium on Non-Point Sources of Pollution from Forested Land served as another reminder that Illinois is way out in front in 208 planning. The two-day symposium at the student center on the Carbondale campus of Southern Illinois University drew 187 registered participants October 19 and 20, and a total attendance of nearly 300. While many of the participants were from Illinois, a total of 29 states were represented. Many of the people attending from out of state were openly looking to Illinois for guidance in planning 208 projects in their home states.

The 23 presentations at the symposium ranged from highly technical scientific papers to suggestions on how to approach the economic and social questions that must be addressed by a successful 208 plan.

More Base Data Essential

The speakers who directly addressed forest management agreed that forest industries are not major sources of water pollution in Illinois, at least not when compared to row crop production.

However, they also agreed that almost no existing data can demonstrate the extent to which forested lands in the eastern United States do contribute to water pollution. Gary Rolfe, of the University of Illinois Department of Forestry, said that all the available baseline data in that area "could be placed on the head of a pin."

Consensus? Foresters and woodlot owners should be aware of the potential of erosion and other types of water pollution. But before any plans for changing forestry practices are seriously discussed, careful studies should be made to determine the specific characteristics of runoff from managed and unmanaged forest land.

Thanks to Jerry Aubertin

The symposium was organized and moderated by Jerry Aubertin. Aubertin is an associate professor in the Department of Forestry at Southern Illinois University, and chairman of the forestry subcommittee of the 208 Task Force on Agricultural Non-Point Sources of Pollution.



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Guidelines for Implementation Phase

Illinois' 208 task force is scheduled to hold its last meeting in February of next year. Between now and then, the group must finish its recommendations on how the state should see that its new 208 plan is put into practice. At the October task force meeting Chairman Jim Frank spoke briefly about what points must be addressed in any recommendations for implementation.

Here's a summary of what he said.

1. Implementing Agencies — The plan should designate which agencies, whether new or existing, should handle which portions of the plan.
2. Cost of Implementing Best Management Practices — A total cost for the implementation phase of the program should be identified and, where possible, be broken down as to the cost to the management agencies, cost to the owner-operator, and cost to the pub-

lic for economic incentives. For management agency costs and economic incentives, the source of revenue should be identified.

3. Institutional Relationships — There should be a discussion as to how the various management agencies coordinate with one another, and what new relationships may need to be formed to better implement the plan. This discussion may include how cooperating agencies support main implementing agencies.
4. Legal Constraints — A discussion of the existing authority of implementing agencies needs to be included so that it is apparent whether any legislative or rule-making changes need to occur. The key factor to be considered is whether the implementing agencies have adequate legal authority to carry out the programs which they are charged to administer. If authorities need to be added or deleted, the nature of those changes should be identified as well as the preferred method of making the changes.

BMP Discussion on TeleNet December 20

Mark December 20 on your appointment calendar. At 9:30 a.m. that day a 2½ hour TeleNet program will be devoted to best management practices being considered for recommendation by the 208 task force.

Subcommittee chairmen working in the areas of soil erosion, fertilizers, pesticides, livestock, forestry and fruit production will bring you up to date on their work in the 208 planning process.

As this newsletter is prepared, 21 TeleNet stations are signed up to carry the program. They blanket the state fairly well; the only thin spots occurring in the southwest.

More stations may be added to the December 20 net-

work, but county extension offices in the following cities will definitely carry the program:

Freeport	Cambridge	Pittsfield
Rockford	Ottawa	Springfield
Belvidere	Henry	Sullivan
De Kalb	East Peoria	Shelbyville
St. Charles	Melvin	Hardin
Joliet	Macomb	Fairfield
Kankakee	Lincoln	Benton

Before the 20th, your County Extension Adviser should know which TeleNet stations near you will carry the program.

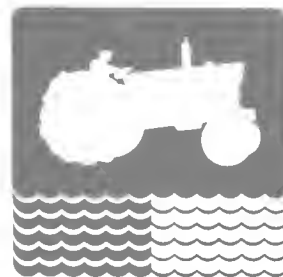
Robert D. Walker
Extension specialist
Natural Resources

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"208" Update for Agriculture

AGRICULTURAL ISSUES RELATING TO STATEWIDE WATER QUALITY PLANNING



Vol. 2, No. 5

December, 1977-January, 1978

BMPs for Soil Erosion Control

In preparing its recommended Best Management Practices (BMPs), the Soil Erosion Subcommittee of the Task Force on Agricultural Non-Point Sources of Pollution has had the difficult job of examining a set of practices designed to accomplish one goal and adapting them to the accomplishment of a goal which is quite different.

For more than 40 years, soil conservation has been official policy in Illinois. Over the years, government agencies such as the Soil Conservation Service and the Agricultural Stabilization and Conservation Service have developed management practices designed to keep soil in place *so that the productivity of the land will be maintained*. The subcommittee on soil erosion began its work assuming that keeping the soil in place means soil will not enter streams or ponds, and water quality will thereby be improved.

While the logic of that assumption seems unassailable, no adequate background information exists to prove that it is true. So the soil erosion subcommittee has had to base its work on incomplete experience. The subcommittee recommends that changes in water quality caused by the employment of various soil conservation practices be carefully monitored in the future so that those practices can be more accurately evaluated according to their usefulness in improving water quality.

Report a Do-It-Yourself Guide

The bulk of the subcommittee's report consists of a number of charts which rate the effectiveness of various conservation practices (contour strip-cropping, terrace construction, and the exclusion of livestock from waterways are examples) in controlling specific erosion or erosion-related problems (examples: sheet erosion, rill erosion, and nutrient loss) within a certain land-use context (examples: cropland, farmsteads, and construction areas).

For use in conjunction with those charts, the report includes a map of the state which defines general soil types by area.

The sample chart which follows is a portion of what was developed for application to cropland.

Applicable Conservation Practices	Effectiveness for control of:				
	Sheet & rill erosion	Channel erosion	Sediment in transport	Water infiltration	(a) Nutrients & pesticides
Land Use Change to Conservation Use	high	med.	high	high	N - P M / H
Strip-cropping					
1. Contour	high	low	med.	med.	M / H
2. Field	med.	low	low	low	M / H
Terraces					
1. Tile Outlet	high	high	high	low	M / -
2. Waterway Outlet	med.	med.	med.	low	M / M
Waterways (grassed or lined)	0	high	low	0	O / H

By approaching the soil erosion dilemma in this way, the subcommittee hopes to make it easy for the individual land user to select the best possible practices for the specific set of circumstances he has to work with. The subcommittee intends to provide a tool for the farmer to use in making his own decisions. That intent is stated in the "Policy" portion of the subcommittee's BMP report:

Selection of the best management system to be applied will be made by the land user from the appropriate suitable alternatives and will be based on the land conditions and the land user's needs and goals consistent with water quality management.

Fertilizers No Link to Pollution

The fertilizers subcommittee of the task force is holding fast to its opinion that fertilizer use in Illinois agriculture does not pose a significant, demonstrable threat to the quality of the state's water. The subcommittee's BMP report recognizes that fertilizer use can be abused, promoting chemical runoff, but states that "... we believe that the majority of farmers employ fertilizers in

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an acceptable manner and that only a small portion of farm users would account for such infrequent abuses as occur."

The report flatly opposes government regulation of fertilizer use, but does include a number of suggestions for the most efficient and hazard-free use of fertilizers.

Soil testing, according to the subcommittee report, is the most important single guide to proper fertilizer use. The report recommends that soil be tested every four years, and that fertilizer be applied only to correct those nutrient deficiencies determined, through testing, to exist.

The report also recommends that soil productivity information, based on both soil type and previous cropping history should be combined with soil test results in arriving at decisions on the amount and kind of fertilizer to use.

The report makes detailed recommendations for the proper timing of various fertilizer applications — particularly those affected by temperature in their efficiency and tendency to remain in place.

Slope of land and soil type are also addressed in the

fertilizer subcommittee BMP report. For example, the report says it is important *not* to apply fertilizers "... on the surface of barren soil having more than 5% slope nor leave the fertilizer on the surface without proper incorporation. Do not apply fertilizers on the surface without incorporation where significant surface runoff is likely to occur, such as on frozen soil."

For many fertilizer applications, farmers are referred to information already available, such as the *Illinois Agronomy Handbook* and IEPA guidelines for the field applications of farm manures and sewage sludges.

"A good farm plan," says the report, "can benefit every farm operator. The 'best management practices' which the committee recommends can be a part of every farm plan."

The report also makes some suggestions to government agencies, rather than to the farmer who is directly responsible for the application of fertilizers. The state is called on for intensified educational efforts, and more research into areas such as efficient fertilizer application and potential impacts on water quality of various fertilizing agents.

Pesticide Subcommittee Recommends Continuing Study

Like the groups studying soil erosion and fertilizer use, the task force subcommittee on pesticides is not willing to recommend any new government regulation.

The subcommittee's primary recommendation is for a substantially upgraded system of monitoring pesticide use, and of analyzing the environmental effects and potential effects of those pesticides currently in popular use. The subcommittee's BMP report laments the fact that volumes of information have been collected concerning the residual tenacity of the organochlorine insecticides (principally DDT and dieldrin) which have now been banned nationwide, while similar information concerning current use compounds is often hard to find.

Subcommittee members feel that it has been more than adequately demonstrated that the organochlorine compounds have found their way into virtually every element of our environment. Their complaint is that new studies verifying the low level presence of the now-outlawed organochlorine compounds seem to be done at the expense of monitoring and research into the long-term effects of the compounds which are *currently* being spread, by the millions of pounds, across Illinois.

To correct what the subcommittee sees as a serious information gap, its first recommendation is that:

The Illinois Interagency Committee on Use of Pesticides appoint a permanent Illinois Pesticide Monitoring Board to establish and supervise a State Pesticide Monitoring Program.

The report suggests that the Pesticide Monitoring Program include the following elements: systematic monitoring for pesticides in water; testing of all pesticides used in Illinois in a model aquatic environment;

annual surveying of pesticides used in the state; and economic analyses of any regulations proposed for a specific pesticide or class of pesticides in Illinois.

Integrated Pest Management Endorsed

According to the report, the potential for future water pollution by pesticides can be reduced through long-range programs such as "integrated pest management." The report says that through the integration of *all* pest control measures — pesticide use, crop rotation, the introduction of biological agents and tolerant crop varieties — "the amount of insecticides used in Illinois could be substantially reduced." To that end, the pesticides subcommittee's report further recommends that the state "encourage and support pest management research that focuses on integrating pest control/crop production systems and educational programs that aid user-implementation of these techniques."

Livestock Waste: Current BMPs and Future Possibilities

The subcommittee on livestock waste has reported not only on those practices currently recommended, but on some possibilities for the future of waste management in livestock production.

The report states that land application of livestock waste is, in almost all cases, the most economically attractive disposal method, and that it is an acceptable and environmentally sound practice when conducted responsibly.

The report suggests, and elaborates on, the following guidelines:

- Livestock waste application should not exceed the agronomic nitrogen rate.
- The soil loss tolerance should not be exceeded on soils receiving livestock waste.
- Surface application may be used only when the land slope is no greater than 5% or when the yearly average soil loss is less than 5 tons per acre.
- If wastes are spread on frozen or snow-covered land, such application should be limited to land areas on which the land slopes are 5% or less or adequate erosion control practices exist.
- Livestock waste should not be applied to a flood plain unless injection or immediate incorporation is used.
- Livestock waste should not be applied during or immediately after a rain or to a saturated soil.
- Livestock waste should not be applied within 200 feet of surface water unless the water is upgrate or there is adequate diking.

The report includes BMPs for nearly all standard configurations of livestock production facilities. For covered confinement systems, the report contains specific information on solid floors, liquid manure storage, and flushing gutters. Detailed recommendations are also made for milkhouses and milking parlor waste, silage leachate, poultry watering and egg production.

Much of the report is devoted to the open feedlot, although the management of open feedlots is already regulated by federal permit requirements, and similar state regulations are pending. The subcommittee report offers an explanation of the regulations along with drawings of the structures (settling basin and holding pond) suggested for compliance.

Future Systems Explored

In its report, the livestock waste subcommittee offers some insight into what could, in the future, become best management practices. Several ideas currently under-going study are discussed in the report:

- Recycling of livestock waste through nutrient uptake by fishes and other aquatic organisms
- The use of earthworms and/or composting to convert livestock waste into a soil conditioning and enrichment agent
- The production of useable methane gas through bacterial decomposition of livestock waste

Public Information Strategy

According to a schedule approved at the November task force meeting, the various subcommittees will have their recommendations for best management practices and for implementation of those practices finalized by March. The next major effort will be aimed at gaining as much public input as possible before recommendations are submitted to the state.

The plan to collect public comment calls for five public meetings to be held in late March. The meetings will be located in the northern, east-central, southern, and western portions of the state.

In April, another round of public meetings will be conducted by the Illinois Environmental Protection Agency's Regional Advisory Committees.

Finally, each organization represented by membership on the task force will be asked for formal comment.

While the schedule is tight, it is hoped that a good deal of public input can be obtained in time for the task force to review it before its plan for dealing with agricultural non-point sources of pollution goes to the IEPA in November.



Champaign County residents hear a description of how parallel tiled outlet terraces reduced soil loss from a field used for row crop production.

This all-day bus tour of Champaign County was designed to acquaint urban and rural residents with types of water quality and sedimentation problems that exist, some of the measures which can be taken to bring those problems under control, and how they all relate to the 208 planning process.

The tour was sponsored by the Soil Conservation Service, the Agricultural Stabilization and Conservation Service, the County Soil and Conservation District, the Cooperative Extension Service, the County Regional Planning Commission, and the Illinois Environmental Protection Agency.



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Voluntary vs. Regulatory Approach Still a Problem

Members of the 208 Task Force on Agricultural Non-Point Sources of Pollution are still concerned about how government agencies will approach on-the-farm pollution control. The task force has been working with the assumption that there are two acceptable ways to deal with agricultural pollution problems: legally enforceable government regulation of farm practices, and voluntary use of best management practices (practices designed to reduce water pollution).

Generally speaking, task force members have favored the voluntary method of addressing agriculture-related pollution problems and potential problems. But as the date for submitting recommendations to the Illinois Environmental Protection Agency draws nearer, some task force members seem more and more inclined to believe that the state and federal EPAs are interested only in the regulatory approach.

The subcommittee studying fertilizer use opened its best management practices report by saying that government regulation of fertilizer use is not warranted. The report outlined suggested practices which farmers should voluntarily employ to ensure the safest possible use of fertilizers.

But speaking of that approach, fertilizers subcommittee chairman Keith Leasure said recently, "I've got the vague, uneasy feeling that I'm working down a street that's not on the roadmap. . . . I just don't want to send in something that's not going to float anyway."

Voluntary Controls for Phantom Problems?

Leasure's comments were made at the November 28 task force meeting during a lengthy discussion of what attitude state and federal government officials are likely to take. The task force's discussion lasted for most of an hour and seemed, to some who heard it, to amount to this: where a pollution problem can be determined to exist, a program of regulatory control must be enacted;

and only if an area can be certified as pollution-free can a program of voluntary measures be acceptable as a control.

(You may reasonably ask, "So what is there to control in a pollution-free area?")

The apparent confusion prompted a subsequent telephone conversation with Jim Frank, of the IEPA, who is chairman of the task force. From his Springfield office, Frank said that he thinks the government review of task force recommendations will be complex and flexible. He said he thinks the language coming from Washington is broader and more difficult to interpret than it should be, and that the final "voluntary vs. regulatory" decisions will be made by the USEPA's 10 regional directors. According to Frank, the regional directors will take the following points into consideration in deciding the circumstances under which voluntary measures will provide adequate control: the severity of documented pollution problems; the historical success of previous programs designed to address a particular problem; and the most practicable and constitutional means of dealing with problems which vary in degree from place to place.

Robert D. Walker
Extension specialist
Natural Resources

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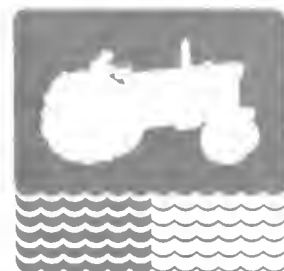
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"208" Update for Agriculture

AGRICULTURAL ISSUES RELATING TO STATEWIDE WATER QUALITY PLANNING



Vol. 2, No. 6

February, 1978

Implementation Ideas Ready for Public View

Subcommittees of the 208 Task Force on Agricultural Non-Point Sources of Pollution have virtually finished their work on recommendations for implementing management practices which task force members believe will help stem the flow of agriculture-related water pollution.

The Implementation Reports of all six task force subcommittees will be discussed in five public meetings to be held around the state near the end of March:

March 20	Macomb	4-H Center
March 21	DeKalb	Farm Bureau Building
March 27	Ullin	Shawnee Community College
March 29	Normal	ISU Student Union
March 30	Mt. Vernon	Rend Lake Community College

All meetings will begin at 1:00.

In this issue of "208 Update for Agriculture," we provide a preview of the reports.

Erosion Control Goals for Water Quality Set Through 2020

Implementation of best management practices recommended by the task force's soil erosion and sedimentation subcommittee is based on the establishment of four goals:

- * 1983 — Accelerated planning and education to reach owners and managers of all Illinois agricultural land experiencing soil loss in excess of 10 tons per acre per year.
- * 1990 — Accelerated planning and application. No soil loss of more than 10 tons per acre per year.
- * 2010 — No soil loss exceeding 7 tons per acre per year.
- * 2020 — No soil loss exceeding 2 to 5 tons per acre per year.

Implementation of recommendations for the control of soil erosion and sedimentation is considered fundamental to the success of control programs designed for all other problem areas addressed by the task force. Implementation, as outlined by the subcommittee, requires a comprehensive network of cooperation among *existing* government agencies at the federal, state, and local levels.

Most Ag and Environmental Agencies to Be Involved

At the federal level, the soil erosion subcommittee feels that over-all responsibility for administering Sec-

tion 208 of Public Law 92-500 lies with the U.S. Environmental Protection Agency (USEPA). All progress reporting, according to the subcommittee, should be reviewed by the USEPA, but no direct administration of the state program should be undertaken by either USEPA in Washington or the USEPA Region V Administrator in Chicago.

The subcommittee recommends a prominent role for the U.S. Department of Agriculture (USDA). Within the USDA superstructure, specific areas of involvement are spelled out for the Agricultural Stabilization and Conservation Service, the Soil Conservation Service, the Economic Research Service, the Agricultural Research Service, the Farmers' Home Administration, and the Cooperative Extension Service.

The subcommittee also recommends that the USDA work with the Internal Revenue Service on the development of federal tax incentives designed to promote the implementation of conservation practices.

At the state level, the Illinois Environmental Protection Agency is designated in the subcommittee report as the lead state agency, with over-all responsibility for monitoring implementation and management of the state's 208 plan.

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The participation of other state agencies is also viewed as essential in the recommendations for implementation made by the task force:

- * Illinois Institute for Environmental Quality — research specified by the task force.
- * Illinois Department of Agriculture — distribution of state cost-sharing funds and the provision of assistance to Soil and Water Conservation Districts.
- * Illinois Department of Revenue — development of state tax incentives.

Soil and Water Conservation Districts (S&WCDs) are designated in the subcommittee's recommendations as the agencies best able to provide direct input and control of best management practice implementation at the local level. It is also recommended that S&WCDs initiate the yearly reporting process required by Section 208.

Also at the local level, county governments are en-

couraged by the subcommittee to accept a role of promoting and coordinating the efforts of local units of government and S&WCDs.

The role of private industry — consulting firms and contractors — is recognized as significant.

Costs Will Be High

The cost of meeting the recommended state soil loss goals set through the year 2020 has been calculated at approximately \$1.3 billion at current prices. The estimate was made following a survey of Soil Conservation District personnel in 21 randomly selected Illinois counties.

As high as the estimate is, it includes only the cost of practices and structures. It does not include any accounting of the cost of production losses due to land use changes.

New Monitoring Agency Main Recommendation of Pesticides Group

The subcommittee on pesticides is calling for the creation of a new state agency. Specifically, the subcommittee proposes that the Illinois Interagency Committee on Use of Pesticides appoint a nonsalaried seven-member Illinois Pesticide Monitoring Board. The subcommittee members feel that such a board, with a professional project director, is needed to coordinate existing state facilities and personnel in the establishment and supervision of a State Pesticide Monitoring Program.

The subcommittee estimates that the monitoring and reporting duties suggested for the Board would cost up to \$380,000 during the first year of operation, and somewhat less than that in subsequent years.

Container Disposal Gets Attention

The subcommittee feels that the educational structure is already in place which would be required to mount an intensified campaign to encourage the proper disposal of empty pesticide containers. Under the plan prepared by the subcommittee, the Cooperative Extension Service, which already conducts educational pro-

grams in pesticide handling and application, would be responsible for providing added emphasis to the problem of container disposal. An expenditure of about \$25,000 is recommended for the printing of additional informational materials outlining acceptable disposal techniques.

The report includes a reminder that a regulatory program, and the expenses associated with regulation, could become necessary if educational means fail to eliminate the danger of water pollution from improper disposal of pesticide containers.

The pesticides subcommittee further recommends that the state "support and encourage pest management research that focuses on integrating pest control/crop production systems and educational programs that aid user-implementation of these techniques.

The subcommittee recognizes, in its implementation report, that such research would be expensive. The report recommends that the authority for carrying out that research be delegated to the Director of the Illinois Agricultural Experiment Station.

Fertilizers Subcommittee Stresses Education and Research

For implementation of its best management practice recommendations, the task force subcommittee on fertilizers and plant nutrients strongly suggests greater state commitment in the areas of education and research.

In its previous reports, the fertilizers subcommittee stressed the need for gaining more information regarding the effects of fertilizer and nutrient runoff on the state's water quality. Based on certain fundamental assumptions, the subcommittee was, however, willing to make recommendations for the most hazard-free application of agricultural fertilizers. Those recommended

practices ranged from regularly conducting soil tests to systematically rotating crops.

To promote wider implementation of those practices, the subcommittee recommends an expansion of Cooperative Extension Service educational programs. The fertilizer subcommittee implementation report claims there is a need for more specialist personnel with expertise in the areas of farm planning, fertilizer need evaluation, and soil erosion control. The subcommittee estimates the cost of additional needed extension programs at a minimum of half a million dollars annually.

The subcommittee also calls for a more intensive program of education in fertilizer handling, spill cleanup, and container disposal. The report calls this a low cost program which could be handled in existing courses offered by the state's colleges of agriculture, and in the on-going education programs conducted by the Extension Service.

Establishment of Base Data Needed

A third area of need identified by the subcommittee would admittedly be difficult, and quite expensive, to

satisfy. Earlier reports say that a great deal more base information is required if conclusions of any precision are to be drawn concerning the relationship of fertilizer application to water quality. To gather this information, the subcommittee recommends a multi-million dollar program for the purchase of land and research facilities. The report calls for the Institute for Environmental Quality to take responsibility for the research by contracting the work to the state's agricultural colleges which are equipped for research.

Serious Livestock Problems Already Regulated by Statute

While the subcommittee on livestock waste cites the desirability of more emphasis on education and technical assistance, it does not report a need for new implementing agencies or substantially expanded responsibility for existing ones. One potentially major source of water pollution from livestock production facilities, however, is the subject of regulations already on the books.

The Illinois Environmental Protection Act of 1970 authorized the state's Pollution Control Board to adopt livestock waste regulations pertaining to feedlot runoff. Those regulations, applying to feedlots of all sizes, were adopted in 1974, but have yet to be placed in effect. They will likely take effect this year.

Other areas of concern to subcommittee members have already been addressed by written guidelines

judged to be satisfactory. With regard to land application practices, silage leachate, milkhouse and milking parlor waste, and poultry and egg processing, the subcommittee endorses existing guidelines and proposes nothing new.

The cost of complying with pending feedlot regulations is estimated at about \$80 million. There are 58,000 beef, dairy, and swine feedlots in Illinois. About 30 percent, or 16,000, of them have been identified as requiring runoff controls. Equipping each of those feedlots with a holding pond would add up to an investment of nearly \$86 million. Treating the same potential problems with less expensive vegetative filters would require capital outlays of almost \$73 million.

Forestry: Prevention Rather Than Correction Is Needed

In its report on implementation of a system of best management practices, the task force's forestry subcommittee said "... our problem is one of maintaining or improving the already generally high quality of the waters flowing within and out of our forested areas..." The report claims that of all possible land uses, the undisturbed forest produces the most pollution-free water. The report acknowledges the water quality hazards associated with cutting timber, but maintains that those hazards are usually small in scope and of short duration.

In discussion of the forestry report at an early-January task force meeting, chairman Gerald Aubertin answered questions about his subcommittee's failure to address the problem of grazing livestock in forested land—a practice unanimously considered to be a serious threat to water quality. In defense of his subcommittee, Aubertin said that since the grazing of livestock cannot be considered a silvicultural activity (an activity related to the harvest of forest products), it should not be a part of the report.

the state's water, the subcommittee prepared an implementation plan based on minimal government involvement. The subcommittee recommends that the Illinois Department of Conservation's Division of Forestry be the lead agency in the development of a program to monitor and improve water quality as it is affected by forest lands. The subcommittee assumes that some additional funding for the Division of Forestry would be required.

The report also recommends that the all-voluntary program be accompanied by an increased level of government cost-sharing for those management practices which would be a financial burden to foresters and forest land owners through out-of-pocket costs or through value foregone.

While the forestry subcommittee report deals in detail with its plan to promote voluntary implementation of best management practices, it does acknowledge the possible need for stronger measures. The report briefly describes what it calls "voluntary, semi-regulatory" and "mandatory, regulatory" programs which could be put into use if the state determines that an all-voluntary compliance program will not deal effectively with those water quality problems associated with silvicultural activities and forest-land management.

No New Implementing Agency

Because it considers pollution emanating from forested land to have a relatively insignificant impact on

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Fruit Production: Problems Do Not Warrant Regulation

Fruit production does not pose a significant water quality problem in Illinois. In fact, for the purposes of 208 planning, fruit production in the state should be formally declared a "non-problem." That's the uncomplicated conclusion of the fruit production subcommittee of the task force.

- * Of the total cropland in Illinois, far less than one percent (about 16,000 acres) is in orchards.
- * Of those 16,000 acres, nearly 90 percent are planted in continuous sod or another cover crop.
- * It is estimated that only 3 hundredths of one percent of the state's orchard acreage is in need of additional erosion control practices.
- * The only chemicals which suggest accumulation due to fruit production are those organochlorine compounds

which, because of their persistence, are no longer registered or recommended for orchard use.

That information, explained in somewhat greater detail, led the writers of the fruit production subcommittee report to conclude that "... fruit growing is a highly insignificant potential source of water pollution, and fruit growing should not be included in a Section 208 regulatory program for water quality in Illinois."

The committee did, however, prepare a series of best management practices to "... advise commercial fruit growers in avoiding potential non-point sources of water pollution in their operations" in spite of the belief that "most fruit growers are already using many of the recommended techniques."

TeleNet Audience Offers Cautious Support for Recommendations

About 300 people participated in the December 20 TeleNet program devoted to a discussion of the best management practices.

Of those who listened, 139 filled out questionnaires concerning what they heard. Almost 90 percent of the respondents said they feel that water quality is a problem in their home counties.

Other questions were intended to provide feedback for members of the six task force subcommittees. With regard to effectiveness of the recommendations, opinion was split between "Very Effective" (43 to 65 percent) and "Somewhat Effective" (29 to 52 percent).

Asked if they thought best management practice recommendations would be acceptable to farmers and land owners, 50 to 70 percent responded "Somewhat Acceptable." Most of the remainder said the practices would be "Acceptable."

About 56 percent of those filling out questionnaires said that there would be "Moderate Adoption" of the

recommended practices if reasonable cost-sharing were made available. One third said that there would be "High Adoption." The rest — about 10 percent — said that "Low Adoption" could be expected even with adequate cost-sharing.

Robert D. Walker

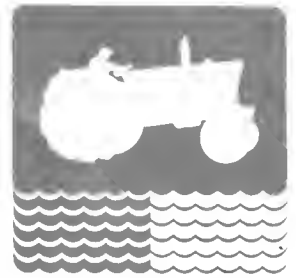
Robert D. Walker
 Extension specialist
 Natural Resources

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"208" Update for Agriculture

AGRICULTURAL ISSUES RELATING TO STATEWIDE WATER QUALITY PLANNING



Vol. 2, No. 7

March, April, May, 1978

Task Force Members Hear First Minority Reports

The first formally prepared minority reports were presented at a Task Force meeting, February 27. Six Task Force members made oral presentations of their objections to various aspects of previous subcommittee work.

Task Force Chairman Jim Frank, of the Illinois Environmental Protection Agency (EPA), prefaced the minority opinion reporting session by outlining the reasons for hearing those opinions. He said no Task Force member should be without a voice simply because he or she was out-voted by the majority. He added that the minority reports would also allow Task Force members to communicate with the whole group — as opposed to only members of their own subcommittee and to address the work of subcommittees other than their own.

Written minority reports will be appended to the final Task Force report.

Is the Task Force Underestimating the Problems?

Mike Conlin, chief of the Division of Fisheries of the Illinois Department of Conservation, accused the Task Force of ignoring the severity of the problems caused by agricultural pollution. Regarding the voluntary control plan proposed by the Soil Erosion and Sedimentation subcommittee, Conlin argued that the voluntary measures recommended by the Soil Conservation Service for the past 40 years have not significantly decreased soil losses from Illinois farmland, and that it is not realistic to expect results from a new voluntary plan. He said new attempts to control soil losses must be tougher than the old ones. He suggested a combination of voluntary and regulatory measures.

In his minority report, Conlin also challenged the composition of the Task Force. He said, "It is obviously dominated by agricultural interests" and charged that, as a result, its report does not constitute "an objective assessment" of the problems addressed.

In direct contrast to Conlin's point of view, Task Force member John Raschke, representing the Illinois Livestock Feeders Association, said he thinks the Task Force has too little information on which to base any immediate recommendations for controlling agricultural pollution. Raschke said too little is known about the relationship between soil losses from farmland and the siltation of Illinois streams and lakes to warrant the imposition of soil loss limits.

While Conlin stated a need for stronger pollution control steps, Raschke suggested the Task Force "tell the feds we don't know enough to solve the problems."

Representing the Illinois Land Improvement Contractors' Association, Dale Sutton reported to the Task Force that, in his opinion, subsurface drainage should be considered a best management practice (BMP) recommended by the Soil Erosion subcommittee. Sutton also said he feels the importance of the Contractors' Association has been understated in the latest Task Force report draft.

Richard Sparks, of the Illinois Natural History Survey, told Task Force members he feels they demanded a higher standard of proof for establishing the existence of problems than for establishing their non-existence. Sparks also referred to what he called a "general lack of detail" in implementation reports, and to a "tendency to recommend added funding for existing agencies and programs without critically evaluating the past performance of those agencies and programs."

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Malcolm Levin, of Sangamon State University, generally agreed that voluntary controls would not solve the problems. He spoke specifically of concerns over the potential carcinogenicity and mutagenicity of some certified pesticides. He urged more rigorous testing to determine pesticide safety.

Task Force member Louise Rome, who represents the League of Women Voters, said the League "takes exception" to the suggestion made in at least two subcommittee reports that the administration of agricultural non-point source pollution control programs be removed from the U.S. Environmental Protection Agency (USEPA) and delegated instead to the U.S. Department of Agriculture "whose agencies, by their neglect, are responsible for soil erosion in agricultural areas." Rome was also critical of the Soil Erosion subcommittee's recommendation for a long term program to reduce soil loss rates. She said the time required for the subcommittee's plan is inconsistent with federal clean water mandates.

Task Force Faces USDA Budget Reductions

The Task Force has gone on record in opposition to proposed USDA budget reductions affecting experiment stations and the Cooperative Extension Service.

Every Task Force subcommittee report indicates a need for more Extension education if recommendations for the control of agricultural sources of water pollution are to be implemented. The implementation reports of several subcommittees claim more research is needed to determine the effectiveness of the practices recommended for agricultural pollution control.

In the meantime, the Carter administration has proposed a USDA budget which cuts \$9 million from the Extension Service and shifts \$15.6 million from experiment stations to a program which funds competitive research grants.

Chairman Frank says, "We have a dichotomy at the federal level. We have, in the opinion of the Illinois Ag Task Force, a need for the very services and expertise being cut back at the federal level."

To express their concern and displeasure, Task Force members prepared the following resolution:

Whereas, The Illinois Task Force on Non-Point Sources of Pollution was formed to assist the State of Illinois in preparing a state water quality plan as mandated by P.L. 92-500, and the Task Force has analyzed the various non-point source environmental issues involving agriculture through the use of five subcommittees; and

Whereas, Each subcommittee of the Task Force has noted the need for additional research to find solutions to agricultural environmental problems and the need

for an aggressive Cooperative Extension Service program to bring farmers the latest information and research results on how to solve environmental problems; and

Whereas, The Task Force is aware that the Federal Budget for fiscal year 1979 submitted to Congress by the President proposes to make significant reductions in federal funding for both the Agricultural Experiment Stations and the Cooperative Extension Service; therefore be it

Resolved, That the Task Force wishes to express its strong displeasure with such proposed reductions and seeks not only to have the funds restored to their 1978 levels but to be increased to adequately meet the needs of 1979.

The resolution has been sent to the Illinois congressional delegation, and to other agricultural and governmental leaders whose opinions might influence the final budget-making decisions.

Financial Assistance: How Much Will the Culver Amendment Help?

Although most Illinois farmers have responded favorably to the Task Force's proposed "208" Plan, the plan's financing continues to be a concern.

During five statewide public meetings held in March, a majority of farmers said the BMPs would be financially beyond their reach, unless sufficient cost-share funding was made available.

One Morgan County farmer commended the Task Force on its comprehensive plan, but compared the cost of its implementation to "being on welfare and shopping for a Rolls Royce." He said a large number of Morgan County farmers would be interested in terraces, ponds and waterways if they had financial backing.

In response, Chairman James Frank said the Culver Amendment authorizes money for the implementation of BMPs in various state plans approved by the USEPA.

The Culver Amendment to the Clean Water Act establishes long-term contracts of 5 to 10 years with the rural landowners and operators for installing and maintaining BMPs. Two and four hundred million dollars have been requested for cost-sharing for fiscal 1979 and 1980 respectively. Frank added that the exact amount of cost-sharing money is still being negotiated.

According to the National Association of Conservation Districts (NACD), only those project areas with approved "208" rural non-point source plans are eligible for Culver funds. The NACD says the plan must: (1) show that agriculture non-point sources of pollution exist, (2) contain a list of agriculture non-point source problem areas and sources in order of their severity, (3) identify the BMPs to control the problem(s), (4) designate a management agency to implement the "208" Plan, and (5) agree to an implementation schedule.

Abandoned Coal-Mined Land Restoration To Begin Soon

The restoration of abandoned coal-mined lands will begin this summer in Illinois says Governor James Thompson.

Under the Surface Mining Control and Reclamation Act of 1977, the state of Illinois will administer the Abandoned Mine Reclamation portion of the law, while the Soil Conservation Service (SCS) will direct the Rural Land Abandoned Mine Reclamation section. A total of 118,711 acres of Illinois' land may be affected by these programs.

Some unreclaimed mine areas are unaesthetic and are continuing sources of water pollution. According to M. Rupert Cutler, assistant secretary of agriculture



STRIP MINING AT ITS UGLIEST

Some unreclaimed mine areas are continuing sources of water pollution. They may lose 60 to 150 tons of soil per acre every year — contributing to sediment and other pollutant levels in lakes and waterways.



IN AN EFFORT TO REDUCE SOIL EROSION... trees have been planted on strip mine spoil banks. The Department of Mines and Minerals will use money collected from coal operators to grade, shape, and revegetate areas of this type.

for conservation, research, and education, some un-restored coal-mined lands lose approximately 60 to 150 tons of soil per acre every year. This run-off carries sediment and other pollutants into lakes and waterways. It is hoped these projects will provide land stabilization and erosion control.

The SCS will help rural land users develop and apply conservation techniques for the restoration and development of eligible, privately owned coal-mined land. They will also provide land owners with long term cost-sharing contracts of 3 to 10 years.

Illinois coal operators will bear much of the reclamation cost. They are currently paying a federal severance tax of 35 cents per ton on surface-mined coal and 15 cents per ton on deep-mined coal. Up to 20 percent of the money collected in Illinois may be available for cost-sharing. The rate of cost-sharing will be 80 percent unless there are off-site damages, in which case the rate may be higher.

The Department of Mines and Minerals, administering the Abandoned Mine Reclamation section, may receive 50 percent of the money collected in Illinois. This money will help finance the grading, shaping, and revegetating of other abandoned coal-mined lands.

The balance of the funds, at least 30 percent, will go towards research and education.

Voluntary vs. Regulatory: A Final Decision May Not End the Dispute

"Having been a Washington bureaucrat and having worked closely with the EPA, I strongly suspect that the lack of regulatory mechanisms will cause the EPA to reject the Task Force's recommendations."

A DeKalb man made that statement at the Ag Task Force public meeting in DeKalb, March 21. What will happen if the plan is not approved?

Ag Task Force Chairman, James Frank, says there will be two major repercussions if the plan fails: (1) the Culver Amendment money will be cut off, and (2) planning grant money will not flow to the IEPA, to Soil and Water Conservation Districts, to the Cooperative Extension Service or to other management agencies.

Frank says approving a plan without a regulatory program, however, might upset people who feel the plan does not comply with Section 208 of the Federal Water Pollution Control Act Amendments of 1972. In this case a lawsuit might be brought against the USEPA and a court issue, Frank says, could stop BMP construction grant money.

The DeKalb County League of Women Voters feels a "regulatory program is mandatory under federal law, in court opinion and order." Under Section 208, regulatory programs are not required where the plan certifies that substantial water quality problems resulting



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from non-point sources of pollution do not exist or are not likely to develop in the near future. The League feels the Task Force's report has not proven there is not a statewide water pollution problem caused by pesticides, soil erosion, and plant nutrients.

Generally speaking, Task Force members and state farmers favor the voluntary approach to implementing the state's "208" Plan. However, the final decision on whether the plan should be voluntary or regulatory rests with the Illinois and USEPA. Regardless of the outcome, it seems a final decision will not necessarily end the dispute.

EPA May Deny Soil Erosion Subcommittee's Plan

If the DeKalb County League of Women Voters seemed less than pleased with the proposed "208" Plan, so was Noel Kohl, chief of the Illinois Planning Section of the EPA in Region V.

In a recent public Task Force meeting, Kohl said he was "dismayed and discouraged" after reading the recommendations of the Soil Erosion subcommittee. Kohl said he could not understand how the committee members, "who are close to the land and its problems," could support a voluntary erosion control program. "It is our (Region V) opinion," he said, "that the serious water quality problems, described in the report, will

not be eliminated or mitigated by the 'business as usual' approach recommended by the Task Force."

Kohl said he thinks the EPA will deny the proposed plan for these reasons: (1) although the Task Force presents evidence demonstrating that a substantial water quality problem attributable to agriculture exists, they give no justification for the long implementation period, (2) the group has not established annual short term goals or reduced figures to a common measurement unit — such as tons of sediment per unit area, (3) since no short term goals exist, the "systematic reporting" procedure is meaningless, (4) technical and financial assistance initiatives are vague and ill defined, and (5) it has not been shown that the recommended agencies and programs — which are merely extensions of existing programs — have the capability to meet the requirements of P.L. 92-500.

Regarding the subcommittee's suggestion that the USEPA administration of the "208" agriculture program be terminated, Kohl said the recommendation was "inappropriate" and would be "disapproved if incorporated in any certified plan." He said Section 208 of P.L. 92-500 provides the USEPA with full authority and responsibility for administering the "208" program. Kohl said the secretary of agriculture is authorized to establish and administer certain agricultural programs, but only with USEPA concurrence.

Robert D. Walker
Extension specialist
Natural Resources

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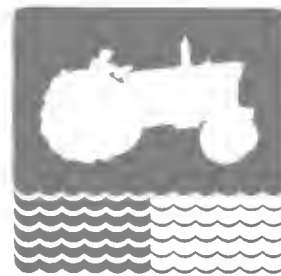
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"208" Update for Agriculture

AGRICULTURAL ISSUES RELATING TO STATEWIDE WATER QUALITY PLANNING



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June, July, August, 1978

Final Ag Task Force Meeting Held

The Ag Task Force recommends that no Illinois land exceed 10 tons of soil loss per acre annually by 1990.

This recommendation was made at the final Task Force meeting held in Champaign June 19. The group met to approve the Soil Erosion and Sedimentation subcommittee's implementation report.

The Task Force recommends that soil losses on gently sloping land (up to 4 percent slope) be reduced within the soil loss tolerance levels also within the 12-year period. "About 7.7 million acres of the 13.4 million acres needing controls would be adequately treated by 1990 if we meet our goal," says Soil Erosion subcommittee Chairman Bob Walker. The 2010 state water quality goal of no state land exceeding soil loss tolerance levels, can best be met with a voluntary program combining educational and incentive efforts, says Walker.

By increasing understanding of the problem and its solutions, The Task Force says farmers may voluntarily improve state water quality. The Task Force recommends stepping up Extension and educational programs on soil fertility, livestock waste management and soil erosion and sedimentation.

Numerous economic incentives were also approved by the group. The Task Force agreed more farmers would be encouraged to cooperate with the program if (1) 90 percent cost-sharing is available, (2) the \$2500 cost-sharing limit per individual and per farm is eliminated, (3) income tax on cost-sharing payments is eliminated and (4) low interest loans for installing best management practices (BMPs) are continued. Other incentives were also recommended with the idea that greater variation would increase farmer cooperation. Fertilizer subcommittee Chairman Keith Leasure says the "country store owner who has more than one brand of soda pop sells more than the store owner who sells just one."

The total cost for the 32-year program will depend on the number of acres put into terraces. Estimates range from \$1.5 billion and \$748 million with 4 and 1 million acres terraced respectively. Fewer terraced acres indicate a ~~subsequent~~ increase in conservation tillage.

The report will be used by the Illinois EPA in developing a state plan and presented to Governor Thompson. Thompson will send it to the Region V EPA by May 1, 1979.

USDA Sets Up Cost-Sharing Program

Federal cost-sharing assistance may be available to farmers needing help with agricultural-related water pollution problems.

The EPA and the U.S. Department of Agriculture (USDA) reached an agreement on the Rural Clean Water Program in Washington, D.C., April 25.

Under this program, Congress authorizes \$200 and \$400 million for cost-sharing in Fiscal Years 1979 and 1980 respectively. Administered by the USDA, the cost-sharing program may pay up to 50 percent of the BMPs' implementation cost.

The program also authorizes the Secretary of Agriculture to enter into long-term contracts — 5 to 10 years — with rural landowners and operators for installing and maintaining state approved BMPs.

EPA Assistant Administrator for Water and Hazardous Materials Thomas Jorling says, "the program is designed to maintain the agricultural productivity of the Nation and, at the same time, improve the quality of its waters."

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Bergland Predicts Disaster

This nation is on a "collision course with disaster," says Secretary of Agriculture Bob Bergland, unless it develops new, practical and cost-effective conservation techniques in the next 20 or 30 years.

Bergland, speaking to the National Association of Conservation Districts (NACD) board of directors in Washington, D.C., said the country needs better conservation strategy in the future, "not just more money for the same old programs."

Bergland said the USDA challenges the NACD and conservation districts "to think about the dimensions of the problem... and come up with a plan." Bergland said it is senseless for the federal government to preempt state and local natural resource planning, when local conservation districts know area needs and state decision makers. The federal government should get involved only when there is a conflict between states or when a state refuses to carry out its responsibility, he added.

Bergland's speech marks the first time the secretary of agriculture has requested a meeting with the NACD board.

BMPs Control Soil Erosion

Illinois cropland loses about 138 million tons of soil annually through erosion - and much of it ends up as sediment in waterways.

The Soil Erosion and Sedimentation subcommittee believes this figure can be cut 70 percent by reducing erosion to the soil loss tolerance level of 3-5 tons per acre. Results would be twofold: water quality improvement and sustained soil productivity.

The subcommittee says these two goals could be achieved if farmers voluntarily adopted the recommended best management practices. The practices include a wide variety of conservation practices such as conservation tillage and terracing.

Conservation Tillage Saves Time, Fuel and Soil

According to the Illinois Agronomy Handbook, 45 percent of Illinois farmers have changed tillage practices since 1970. Over half name erosion control as the reason.

Tillage systems that help control erosion are called conservation tillage systems. Conservation tillage leaves the soil surface rough and porous, and protected with at least a partial plant residue cover. Because less tillage is required than with conventional practices, conserva-

tion tillage saves time and fuel thus reducing costs.

Its primary benefit, the Handbook states however, is erosion control. The Task Force on Agricultural Non-Point Sources of Pollution recommends conservation tillage as a best management practice for reducing soil erosion and improving water quality. Soil erosion may be reduced by 50 to 75 percent, depending on how much crop residue is left on the ground. The irregular soil surface and the plant residue hinder the detachment-transport process by forming barriers that intercept water runoff.

Conservation tillage systems use different tools for primary tillage (moldboard plow, chisel plow and disk) and secondary tillage (disk, harrow and field cultivator). How and when these tools are used is very important to the system's success.

Tillage practices influence all crop production areas. A system can affect crop yields, disease and weed control, drainage, soil temperature, and fertilizer distribution. Conservation tillage is no exception.

Crop residue on the soil surface insulates the soil from the sun's heat, keeping the soil cooler than normal throughout the growing season. Although the cool temperature slows early corn and soybean growth in May and early June, it is beneficial later in the season, the Handbook notes.

Conservation tillage also does not mix the soil as thoroughly as conventional methods. As a result, nutrients, particularly phosphorus and potassium, will concentrate near the soil surface. This however, seems to have little effect on crop yields.

The two potential problems with conservation tillage are weed and insect control. Unlike conventional methods where weed seeds are buried too deep for germination, conservation tillage leaves weed seed on or near the surface. The existence of plant residue also reduces surface evaporation creating a moist environment ideal for weed growth.

Residue also may cause disease control difficulty. With clean tillage, residue from the previous crop is buried or removed. Since buried residue rapidly decays, infected material is usually destroyed through decomposition. Disease-resistant hybrids and varieties can be used to minimize plant disease problems in a minimum tillage operation.

Although conservation tillage may present a variety of problems, the erosion control benefits must not be ignored.

Illinois Farmer Enthusiastic About No-Till

Moultrie County farmer, Byron Boddy, lost 13-15 tons of soil per acre annually on his sloping corn and soybean farmland until he went to no-till farming.

Now he says his losses are "less than a quarter of a ton per acre," and that there's "no rivulets, no washes and no breaking over of corn rows from erosion."



COOPERATING WITH NATURE

Moultrie County farmer, Byron Boddy, no-tills his sloping corn and soybean farmland to keep the soil in its place. He's convinced land productiveness doesn't have to be sacrificed for erosion control.

Many farmers are reluctant to switch to no-till farming because they're afraid reduced yields and insect damage will cost them money. Boddy admits there's a greater need for insect control in no-till farming because the crop residues keep the soil cool and moist — an ideal environment for insects — but he doesn't feel farmers should fear reduced yields. When he first started to no-till farm, Boddy says he wanted to attain yields of 75 percent of what he was getting on conventionally planted flat land. So far, Boddy says he has exceeded his goal and in fact says last year he out-produced his conventional corn by 10-12 bushels per acre.

Boddy says there are other incentives for going to no-till practices. No-tilling can save fuel and may make less productive land more valuable. Unproductive ground, Boddy says, is worth half as much as good flat black land selling for \$3500. "When you can raise the corn yield to 75 or 80 percent of that \$3500 an acre ground, then you're raising the value of that ground up to \$3000," he says.

Boddy says he thinks no-tilling is one of the best soil erosion control methods. He gets satisfaction from knowing he's saving the soil for his children and from making something grow from less productive land. Boddy finds it a challenge cooperating with nature and the land to make it productive. He's convinced soil erosion can be controlled while maintaining land productiveness.

The Soil Erosion and Sedimentation subcommittee recommends no-tilling as one best management practice for keeping soil in its place.

Terracing Reduces Erosion and Sedimentation

Appearances are important — but terracing is more than a farm face-lift. Terracing not only improves the land's looks but its efficiency as well. Recommended by the Task Force as a best-management practice, terracing is one of the most effective ways of controlling soil erosion.

Moultrie County farmer, John Durbin, lost 15 tons of soil per acre annually on his sloping corn and soybean farmland. Watching his yields diminish with the topsoil, Durbin says he realized erosion was "getting into his wallet." Then he built parallel tile outlet (PTO) terraces. Now his soil losses are 3 to 4 tons per acre — well within the soil loss tolerance level — and he's preventing costly seed and fertilizer losses too.

Durbin is impressed with the way his PTO terraces reduce sedimentation. Before he built the terraces, he says he dug 4 feet of sediment from the bottom of an adjacent pond. Now that erosion has been checked, Durbin says there's no sediment — and no pond to dredge.

"Now's the time to get some terracing done," Durbin says. "In the next ten years we're going to see some drastic measures imposed to stop soil loss. I think terracing will play an important role."

Durbin receives a 75 percent cost-share on his terraces from the Agricultural Stabilization and Conservation Service. With their help, he's going to continue to build terraces and control the erosion on his sloping farmland.



THE BROAD BASE...

is a popular PTO terrace cross section type. It enables the operator to farm the entire cross section, making it a farmable and efficient erosion control method.



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PTO Terraces: Terracing Made Easier

PTO terraces are an improvement on traditional terracing systems. They provide effective soil erosion control without the inconveniences of conventional terracing methods.

In the past farmers shied away from terracing because: (1) terrace spacings didn't accommodate modern machinery, (2) uneven spacings caused point rows and (3) cross sections were difficult to farm with multiple-row machinery.

PTO terraces increase farmability and efficiency by eliminating these problems. Because the terraces are parallel, and relatively straight, point rows don't exist and turning between terraces is eliminated. This saves time and reduces the amount of crop damage due to turning. The terrace spacings can also be adjusted to fit the appropriate farm equipment.

Using tile lines to drain runoff water also increases efficiency by eliminating grass waterways—leaving more acres free for production.

An important soil erosion control device, PTO terraces are built to store and carry two inches of runoff water from an area in 24 hours. The runoff water collects behind the terrace ridges and gradually drains off through perforated intakes in the tile lines. The water will stand until it can be drained off through the tile lines—but it will be removed before it causes crop damage or wet spots. Practically all of the eroded soil is held above the terraces.

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The two cross sections most commonly used with PTO terraces are the grassed backslope and the broad base.

The grass backslope is recommended for land with a slope of 8 percent or more. Because the backslope is constructed on a 2:1 slope, it is too steep to farm and therefore it's maintained in sod. This cross section type is being adopted by many Midwestern farmers.

The other cross section used is the broad base. Owen Bidner farms a 300-acre corn and soybean farm in Champaign County. He's built broad-base terraces on 150 acres—and he thinks they're an excellent soil erosion control method. Since their construction, the terraces have cut his soil losses from 4 to 5 tons per acre annually to less than 1 ton.

Bidner likes the farmability of broad-base terraces. Recommended for field slopes of 4 percent or less, they're proportioned to fit an operator's machinery. The frontslope is made the size of the machinery width. The cutslope and backslope are built at least as wide. This enables the operator to farm the entire cross section. This isn't possible with the grassed backslope.

Because his soil losses prior to terrace construction were within the soil loss tolerance level, Bidner didn't have to bother building terraces. But he wasn't satisfied. "All that good black dirt was running into the streams. I figured chemicals were polluting the water enough. Besides, after your topsoil is gone—what's left? Nothing."

Robert D. Walker

Robert D. Walker
Extension specialist
Natural Resources

September-November, 1978



In addition, new feedlots must be located or built so they won't cause groundwater pollution. This means they can't be built on sand or gravel or on soil with fractured bedrock close to the surface.

New facilities aren't to be located close enough to populated areas to cause odor or air pollution problems. The following must be considered before building livestock facilities: (1) the direction and distance from homes or businesses, (2) the type of manure handling system, (3) the number of animals and (4) the number of nearby homes and businesses. Producers should also consider the future development of adjacent non-owned land.

Some livestock facilities will need a permit to operate. Whether or not they receive a permit will depend on several variables, such as the size of the operation.

The Future of Pesticides

In light of the numerous ways the EPA regulates chemical substances, many Illinois farmers are wondering how pesticides will fare in the future.

One Illinois fruit grower says few new pesticides have entered the market because companies are hesitant to invest money in developing new products the government might restrict. He says many of the pesticides he uses have been restricted and wonders what new research is being done in the field of pest control.

Bill Luckmann, chairman of the Pesticide subcommittee agrees that there are fewer pesticides coming on the market. In fact no new pesticides were registered for use in 1977. This "rebuttal against registration," he says, will cause industry to try for greater mileage out of existing pesticides. Chemicals proven carcinogenic will not be retained. Luckmann says the EPA will, however, allow the use of pesticides with some environmental risks as long as those risks are "understood and acceptable."

New research areas provide the greatest opportunity for pest control, Luckmann says. Integrated pest management (IPM) is the latest development in insect control. Researchers hope IPM will maximize pest control while keeping environmental contamination to a minimum.

IPM is a comprehensive approach to pest control, employing a variety of techniques.

A heavy reliance is placed on natural pest control—mainly cultural methods—in combination with other pest suppression processes. According to the Council on Environmental Quality, the purpose of integrated pest management is not to avoid chemical usage but to use the most effective and environmentally sound pest control techniques or combination of techniques for long range pest control.

Pest control can be approached environmentally, genetically and biologically. Environmental and genetic manipulations include land preparation and culti-

vation, crop rotation and using new pest resistant seed varieties. The Council says these practices make the environment less attractive to pests. Plowing physically destroys weeds and kills insects during their soil-inhabiting life cycle period, while crop rotation reduces the number of a particular insect species by decreasing the amount of available food. The Council says diverse food sources provide suitable living and reproducing conditions for the natural enemies of pests.

Biological control methods include the use of predators and parasites, pest-specific diseases and pest sterilization.

Various insects can be used to control insect and weed pests. Parasite and predator usage can be more beneficial than other pest control methods the Council says, because once a predator has been established in an area—pest control will continue for a relatively long period of time.

Bacteria, viruses, protozoa and fungi can also provide substantial natural pest control. These microorganisms are highly specific and can infect large numbers of a particular insect species.

Fertilizers Are Not Above Suspicion

Although the Fertilizer subcommittee finds no evidence directly linking fertilizers with water degradation, fertilizer application must minimize the potential for water quality problems.

For this reason, the Fertilizer subcommittee recommends these best management practices (BMP's) for fertilizer application:

Farmers should test their soil once every four years. Soil testing will help them determine the proper fertility program. Over-fertilization increases the nutrient loss potential. County Extension advisers, and professional agronomists are available for advice. Farmers can send soil samples to one of Illinois' 65 laboratories for soil testing. Combining the soil test results with the previous cropping, fertilization and soil productivity history will give farmers the information they need for fertilization decisions.

Proper fertilizer application timing is important—especially for nitrogen. If farmers intend to apply nitrogen, they should remember that: (1) it is used most efficiently when applied near the time the plants need it, (2) although nitrification can occur at 32-45 degrees F, it increases significantly at 50 degrees F or higher, therefore fall application should be delayed until the soil temperature is below 50 degrees F and (3) fall application of nitrate forms of nitrogen are not recommended.

Farmers should not apply fertilizers on barren soil surfaces having more than five percent slope. They always should incorporate where significant surface runoff is likely to occur.

Sewage sludges and farm manures should be applied following the Illinois Environmental Protection Agency and the Illinois Agronomy Handbook recommendations. Applying sewage sludge and animal manure to agricultural land is becoming an important waste disposal and fertilization method. But caution must be exercised. Farmers must consider the plant nutrient content of the manure or sludge when planning a fertilizer program so that chemical fertilizer rates can be reduced accordingly. This must be done in order to avoid over-fertilizing and polluting surface and ground water.

A waste material's nutrient content depends on its source. Sludges contain many chemical elements in both mineral and organic forms. Of the principal constituents, nitrogen, phosphorus and organic matter are the most important in promoting plant growth and good soil physical conditions. Potassium is also present but only in small quantities. However, the amount of each element varies from one community to another due to the wastewater source and the amount of industrial waste it contains. Generally sludges with larger proportions of industrial wastewaters have higher element concentrations.

The nutrient content of animal wastes depends on the livestock source. Quantities of nitrogen, phosphorus and potassium may vary several pounds per ton depending on whether beef, swine or poultry wastes are used.

Finally, farmers can reduce the nutrient loss potential by using crop rotation. Corn grown in a corn-soybean rotation requires less nitrogen than continuous corn.

The subcommittee believes the above management practices will minimize the possible impact fertilizers have on water quality. Although they find most farmers follow reasonable fertilization practices, the subcommittee feels wider adoption is necessary.

Illinois Farmer Successful at No-till

Moultrie County farmer, Byron Boddy, is more enthusiastic than ever about no-till farming — and with good reason. This year his no-till corn produced as well as his conventional.

Boddy was introduced to no-till farming during a 1960 Dixon Springs Agricultural Center tour. "I was impressed with what I saw, he says. "I remember thinking if they perfect this, they'll have corn all over Southern Illinois."

But Boddy didn't anticipate the success he'd have raising no-till corn. "Our objective was to get the no-till to produce 75 percent of what our conventional was producing," he says. "Then considering the slope, soil type, its production capabilities and its water-holding capacity, we'd consider it a success."

This year Boddy's no-till corn produced 142 bushels per acre, 7 to 10 bushels better than last year's no-till and 4 bushels better than this year's conventional. Although Boddy says all corn everywhere yielded higher this year, he partially attributes his success to a good rye cover crop which he says, "is as important as chemicals for weed control and is also essential for moisture conservation" and winter and spring erosion control.

Boddy is excited about no-till farming not only because his yields are good, but because he's also protecting the soil from erosion. He lost 13-15 tons of soil per acre annually on his sloping farmland until he went to no-till farming. Now his losses are well below the soil loss tolerance level of 3 to 5 tons per acre.

Next year Boddy plans to no-till an additional 35-40 acres of corn, but will continue with conventional tillage on his level land where erosion is not a problem.

No Financial Assistance From Rural Clean Water Program — For Now

Rural landowners and operators hoping to get BMP cost-share money from the Rural Clean Water Program, will temporarily have to find financial assistance elsewhere.

As reported in the last newsletter, the program authorized Congress to appropriate \$200 and \$400 million for Fiscal Years (FY) 1979 and 1980 respectively. The money would have paid up to 50 percent of the BMPs' implementation cost.

Congress, however, didn't appropriate the funds. Whether or not the money will be available in 1979 is still questionable. The Department of Agriculture plans to approach Congress with a supplemental appropriation.

Public Helps Develop Erosion Control Program

Plans for an erosion and sediment control program involving soil and water conservation districts are getting under way in Illinois.

The state's Legislature has amended the 1937 Soil and Water Conservation District Law to provide for a more comprehensive erosion and sedimentation program.

The 1977 amendment directs the Illinois Department of Agriculture to develop the program and guidelines. Public hearings will be held on the guidelines by late 1979. Once the guidelines have been adopted, the 98 Illinois soil and water conservation districts will have two years to form local erosion and sediment control programs and standards.

Each district will have an advisory committee — representing a wide variety of interests — to help develop standards that are technically feasible, economically reasonable and consistent with the Department's guidelines. The standards also will be discussed at local public hearings.



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The program gives the public a unique opportunity to participate in the development of soil conservation standards that will directly affect them. Cost-share money and technical assistance will be available to help land users comply with erosion control standards, providing adequate local, state or federal funds are obtainable.

To avoid confusion with the Illinois EPA Section 208 public hearings — tentatively scheduled for March 1979 — the Illinois Department of Agriculture has scheduled public hearings on their guidelines as follows:

Jan. 22	Farm Bureau Auditorium	Marion
Jan. 23	Best Western Motel	Effingham
Jan. 24	Farm Bureau Auditorium	Champaign
Jan. 25	Cooperative Extension Office	Jacksonville
Jan. 30	Carl Sandburg Community College	Galesburg
Jan. 31	Lovelace Community Bldg.	Dixon
Feb. 1	Farm Bureau Auditorium	Joliet

**In the next 208 Update issue . . .
The IEPA's 208 Water Quality Management Plan guidelines.**

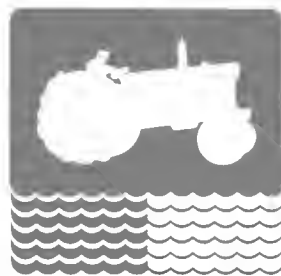
Robert D. Walker

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"208" Update for Agriculture

AGRICULTURAL ISSUES RELATING TO STATEWIDE WATER QUALITY PLANNING



Vol. 3, No. 2

December-February, 1979

IEPA Names Erosion As Greatest Threat

Soil erosion and sedimentation is rated as the greatest threat to water quality in the state 208 Water Quality Management Plan, says A. G. Taylor, IEPA assistant agricultural adviser.

The gross soil erosion for Illinois is estimated at 180 million tons annually, with 158 million tons originating as sheet and rill erosion from rural lands. Although there's little data available on the amount of sediment that reaches state streams, Taylor says the IEPA estimates approximately 8,000 acre feet of Illinois lake and impoundment storage capacity are lost yearly to sedimentation. Each year it would cost Illinois about \$17.7 million to dredge this sediment or \$3.05 million to build new lakes to replace the lost storage capacity. Although building new lakes may be less costly than dredging,

valuable agricultural land would be taken out of production, says Taylor.

Taylor says applying erosion control methods may be the most beneficial solution to the problem. Soil erosion can be reduced to 66 million tons annually — a 58 percent reduction — by meeting soil loss tolerance levels. Soil loss tolerance is defined as the maximum amount of erosion that can occur on a particular soil type with sustained crop production.

The 208 plan states that average annual soil loss per acre shouldn't exceed 50 tons by 1982, 40 tons by 1983, 30 tons by 1984, 20 tons by 1985, 10 tons by 1988, 2-5 tons on gently sloping land by 1990 and 7 tons by 1995. All land must meet soil loss tolerance levels by 2000.

The IEPA has recommended the Illinois Department of Agriculture be the lead agency for the state soil erosion control program. Taylor says the program will be administered and enforced through the 98 soil and water conservation districts. The Department is now developing soil erosion guidelines. Each soil and water conservation district will have two years to set erosion standards after the Department adopts its guidelines.

The present Soil and Water Conservation District law doesn't permit penalties for excessive soil erosion. The IEPA has, however, recommended an amendment to the district law that would require the enforcement of the district standards through Circuit Court action as a "business offense" after a complaint has been brought against the landowner.



Small Open Feedlots Are Primary Concern

Runoff from Illinois' small open feedlots creates the greatest water quality problem produced by livestock operations, says Jim Frank, IEPA agricultural adviser.

Of the state's 58,000 feedlots, about 4,600 beef, 1,300 dairy and 10,200 swine feedlots need runoff controls. Frank says problems usually arise when a stream runs through or near the lot. Under the newly adopted Illinois Livestock Waste Regulations, feedlots will not be

E-Z does it! More inside . . .

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allowed to have streams or other surface water within their boundaries. Frank says producers may have to move such feedlots.

However, a majority of the surface water runoff can be controlled by a diversion system and curbs and gutters, says Frank. These measures will keep clean water out of feedlots and direct runoff to settling basins and holding ponds or to a vegetative filter system.

Cost estimates for Illinois runoff-control measures

could run as high as \$86 million for zero discharge and \$73 million for vegetative filter systems. The IEPA hasn't yet approved vegetative filters as an effective runoff control method. Maintenance or operating costs aren't included in the estimates, says Frank.

The IEPA will administer the program through surveillance activities to determine whether Illinois livestock facilities are complying with the waste regulations by June 30, 1979.

The Pesticide Disposal Situation

Leasure Warns Against Government Intervention

Farmers may be doing a better job disposing of pesticide containers than the federal government thinks — but they aren't doing well enough to make the government relax and forget the problem, says Keith Leasure, Southern Illinois University professor of plant and soil science.

Leasure says the U.S. Environmental Protection Agency (USEPA) wants farmers to triple rinse and puncture empty pesticide containers and dispose of them properly. According to a survey he conducted with 1,081 farmers, 28 percent of their containers were triple rinsed — 84 percent of the farmers said they rinsed the containers at least once. The 466 custom applicators surveyed claimed 15 percent of their containers were triple rinsed — 43 percent said they rinsed the containers at least once.

Leasure warns farmers that if they don't do a better job of following disposal guidelines, the government will step in — and that will cost money.

The EPA is proposing to develop a nationwide pesticide container disposal system, which they estimate would cost about \$250 million the first year. If the cost is divided among the 50 states, Leasure says, each state would need to raise \$5 million a year. In other words, he says, it would cost about \$2.50 to dispose of a 5-gallon can.

"In my opinion it would be worth considerable effort to keep that federal draft plan from getting off the ground," says Leasure. He suggests all Illinois farmers triple rinse their pesticide containers and cooperate with the authorities. If there's a can collection drive in your county, rinse your cans and take them to the collection point. If there's a proposal for a statewide can disposal system — and it costs a dollar a can — he says get behind it and make it go. "Remember," Leasure says, "if you don't do it, Uncle Sam might and it will cost you at least \$2.50 a can."

What Will They Think Up Next?

There's a new gadget on the market that will help farmers rinse their pesticide containers.



The E-Z Rinse resembles a gasoline hose nozzle — with one major difference. The probe at the nozzle's end is sharp so it can puncture the bottom of a pesticide container.

The nozzle can be attached to a garden hose or can T into the outlet side of a pump on a nurse unit. The spray is ejected from small holes in the side of the probe flushing the can's bottom and sides. A farmer can rinse his container as the pesticide empties into his spray tank. Container residues will go directly into the tank.

Manufacturers claim the nozzle will easily rinse any size or shape container.

Disposing of Tank Rinsates

Spraying pesticide rinsates on the soil is the best — but not the most reliable — disposal method.

The soil is alive with hundreds of different organisms that can break down pesticides. The major difficulty in using soil as a disposal system is fluctuating rainfall. Too much rain — some pesticides can leach. Too little rain — microorganism activity rapidly declines, slowing degradation and carrying small amounts of pesticides over to the next growing season.

The University of Illinois Agronomy Department, in cooperation with the Department of Agricultural Engi-

neering, is working on a digestion system that provides the environment for maximum soil microorganism growth.

U of I professor of crop production Fred Slife says the system uses a tank filled with water mixed with soil to provide microorganisms. The aerobic organisms are given oxygen and fed to maintain growth and increase population.

Slife says although some herbicides degrade slower than others, the system appears to break down herbicide rinsates faster than soil alone.

Slife says the system is fragile and can be damaged by high herbicide concentrations.

Fertilizers And Pesticides Not To Be Ignored

Although soil erosion and sedimentation are major water quality concerns, the IEPA isn't ignoring possible fertilizer and pesticide contamination, says Jim Frank.

Frank says 18 Illinois public water supplies periodically exceed the public health standards for nitrate. Nine of the water supplies are surface-water and nine are ground-water supplies.

According to the IEPA 208 plan, numerous studies show there's a potential for fertilizer contamination, however, none provide conclusive data evaluating the extent of concentration from that source. The water quality degradation potential is greatest when too much fertilizer is used or when it's improperly applied.

Frank says the plan recommends testing soil once every four years and following application rates recommended in the Illinois *Agronomy Handbook* to avoid excessive fertilizer applications. The plan doesn't recommend fertilizer regulations.

None of the pesticides currently used are causing water quality problems, according to recent information. Frank says however, persistent organochlorine insecticides used in the past — particularly DDT and Dieldrin — are currently polluting water because their residues remain in the soil.

Disposal of used pesticide containers and dilute rinsate solutions from cleaning spray equipment also is causing water quality problems. The pesticide container disposal problem could be largely eliminated if all containers were triple rinsed. Researchers are currently seeking ways to handle dilute rinsates safely.

The IEPA recommends forming a non-salaried State Pesticide Monitoring Board to check systematically pesticide amounts in water, sediment and fish to detect seasonal and annual pesticide levels in Illinois aquatic environments, says Frank. The IEPA further recommends that all pesticides be evaluated in the Metcalf Laboratory model aquatic ecosystem to identify those compounds that may persist or biomagnify.

The IEPA also recommends initiating programs on integrated pest management and supports container and spray tank rinsate disposal research.

Walker Urges Farmers To Testify

A series of public hearings have been scheduled throughout the state on the Illinois IEPA Section 208 Water Quality Management Plan, says Bob Walker, University of Illinois Extension natural resource specialist.

Walker says the purpose of the public hearings is to give citizens an opportunity to have planning input. Citizens may testify at the meetings or in writing to the IEPA by March 31, 1979. Individuals may support the plan or make recommendations for changes.

Walker urges people who may be adversely affected by the plan to attend a public hearing and explain how the plan will affect them. Testimony should be short, to the point and in writing. Written testimony, however, is not a requirement. The 208 plan may be revised, depending on the testimony, before it is submitted to the governor and the EPA later this year.

A copy of the agricultural portion of the plan is now available for review at all county Extension Service, Soil and Water Conservation District and Farm Bureau offices in the state. Walker says copies of the complete plan — six volumes — have been placed in all regional EPA and planning commission offices and in 60 libraries located throughout the state. A list of libraries has been sent to each county Extension Service office.

Public hearings will be held at these locations and times on the dates indicated:

March 19, 7:00 p.m. Macomb High School Macomb	March 27, 1:30 p.m. and 7:00 p.m. Auditorium Illinois Dept. of Transportation Springfield
March 20, 7:00 p.m. City Council Chambers Centralia City Hall Centralia	March 28, 7:00 p.m. Rockford College Rockford
March 22, 7:00 p.m. Sandburg Hall Illinois Central College East Peoria	March 29, 7:00 p.m. Auditorium Champaign Public Library Champaign
March 26, 7:00 p.m. Board Room, Admin. Bldg. Shawnee Community College Ullin	

IEPA Pleased With Task Force's Work

The 208 Agricultural Task Force has been very beneficial and has established a desirable relationship between the agricultural community and the agency, according to Mike Mauzy, director of the Illinois Environmental Protection Agency (IEPA).

At the December 15 meeting before the former members of the Agricultural Task Force, Mauzy said Illinois

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had set a precedent — not often repeated in other states — for developing a working relationship with the IEPA. "Some states report borderline warfare," he said.

The IEPA called the meeting to discuss the agricultural portion of the 208 state water quality plan.

Money Available for Reclamation

Illinois landowners may receive cost-share payments for the reclamation of their coal mined damaged property, says Bob Walker.

Under the Rural Abandoned Mine Program (RAMP) the Soil Conservation Service (SCS) will get about \$700,000 for reclaiming Illinois land damaged before 1977 by coal mining.

Walker says RAMP is voluntary. The program will be operated by the U.S. Department of Agriculture. The SCS and Soil and Water Conservation Districts will provide landowners with technical and federal financial assistance.

Cost-share rates for up to 120 acres may be as high as 100 percent if there are off-site public benefits, if it's non-income producing land and if reclamation work would be a financial burden to the landowner. The SCS may pay 95 percent on income producing land. If there are on-site benefits only or if there has been no declaration of financial burden, the cost-share rate may be 80 percent on non-income producing land and 75 percent for income producing land. The 120 acre cost-share rate will be reduced 0.25 percent for each additional acre.

Landowners were asked to sign up for assistance at their local Soil and Water Conservation District office

in February, says Walker. The participating landowner must enter into a contract of from five to ten years. Priority will be given to those areas endangering public health, safety, property and general welfare.

Reclamation activities may include land grading, revegetation, and installing surface water control devices such as diversions, waterways and retention ponds.

After reclamation, the land may be used for row crops, hayland, pasture, woodland, non-commercial recreational areas or for a wildlife refuge.

Walker says reclamation funds come from fees on active mines — 35 cents per ton on surface-mined coal and 15 cents per ton on underground-mined coal. About 20 percent of the money is transferred to RAMP.



Robert D. Walker

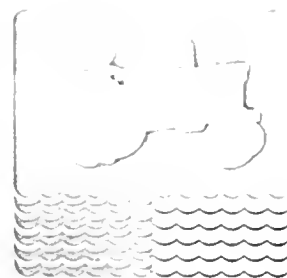
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"208" Update for Agriculture

AGRICULTURAL ISSUES RELATING TO STATEWIDE WATER QUALITY PLANNING



Vol. 3, No. 3

March-June, 1979



Governor Thompson Reviewing 208 Plan

Illinois Governor James Thompson now has the final revised state Environmental Protection Agency (EPA) 208 Water Quality Management Plan.

The governor will review the plan and have the opportunity to make changes before submitting it to the USEPA. The USEPA then has 120 days to approve, conditionally approve or reject the plan.

University of Illinois Extension Natural Resource Specialist Bob Walker says the 208 plan will probably be conditionally approved. That is, some sections will be endorsed, while others may require change to meet federal EPA regulations.

The plan also will be reviewed by other interest groups. Those feeling the USEPA-approved 208 plan does not meet the laws passed by Congress, may file suit in federal court. The court decision could greatly influence its implementation. In the 1975 case of the Natural Resources Defense Council vs. Russell Train,

a district court ruled that 208 planning must be done in all areas — not just those designated by the governor — and that the state government must conduct the planning. Until that time, the USEPA had applied 208 planning only to areas with severe erosion problems.

Witness Testimony Revises EPA Plan

Significant changes were made in the agricultural portion of the 208 plan following the March public hearings, says Jim Frank, Illinois Environmental Protection Agency (IEPA) agricultural adviser.

Over 200 witnesses testified at the public hearings. Their comments were reviewed and considered in developing the final plan before it was sent to Governor Thompson.

Frank says most people supported the Illinois Department of Agriculture as the lead soil erosion control agency. The Department will administer the program under the provisions of the Soil and Water Conservation District Act. Under this law, they will adopt state-

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Figure 1 consists of 15 micrographs, labeled 1 through 15, showing the development of the chick embryo eye. The images are arranged vertically. Micrograph 1 shows a very early stage with a small, dark spot. Micrograph 2 shows a slightly larger, more defined spot. Micrograph 3 shows a larger, more complex structure with some internal detail. Micrograph 4 shows a larger, more complex structure with some internal detail. Micrograph 5 shows a larger, more complex structure with some internal detail. Micrograph 6 shows a larger, more complex structure with some internal detail. Micrograph 7 shows a larger, more complex structure with some internal detail. Micrograph 8 shows a larger, more complex structure with some internal detail. Micrograph 9 shows a larger, more complex structure with some internal detail. Micrograph 10 shows a larger, more complex structure with some internal detail. Micrograph 11 shows a larger, more complex structure with some internal detail. Micrograph 12 shows a larger, more complex structure with some internal detail. Micrograph 13 shows a larger, more complex structure with some internal detail. Micrograph 14 shows a larger, more complex structure with some internal detail. Micrograph 15 shows a larger, more complex structure with some internal detail.

wide erosion control guidelines. Once this is done, the 98 soil and water conservation districts will develop local standards.

The initial draft plan proposed an amendment that would allow enforcement of district standards through circuit court action. Violators would be charged with a business offense. But the proposal has been omitted from the final draft, says Frank. Also omitted from the plan is the clause stating that violators will lose eligibility for cost-share programs if they refuse to comply.

Although the IEPA recognizes the benefits of a voluntary program, it doesn't want to jeopardize erosion control goals, says Frank. After the soil and water conservation districts set their standards, they will investigate complaints of excessive soil erosion. If a person is violating the local standards, the district will offer financial and technical assistance to bring the soil erosion under control. If there isn't sufficient financial and technical assistance to implement the suggested best management practices, the landowner cannot be required to comply.

However, if adequate cost-sharing and technical assistance is available and the landowner still refuses to cooperate a public hearing must be held. The results of the hearing will be sent to the Illinois Department of Agriculture. If a violation exists the Department may hold its own public hearing. If the findings indicate that water quality is being damaged, the Department must

— within 30 days — send a copy of its findings to the IEPA for appropriate action.

The state program will be evaluated annually — based on a report prepared by the Illinois Department of Agriculture — to see what progress is being made towards reducing water pollution from agricultural sources of soil erosion. A five-year evaluation will determine whether or not the Department of Agriculture should remain as the lead management agency.

The state erosion control funding levels were changed so soil and water conservation districts would have funds for technical assistance, says Frank. The recommended funding for 1981 is \$1 million for technical assistance and \$3 million for cost-sharing. By 1984 \$2.5 million for technical assistance and \$6 million for cost-sharing is recommended.

The IEPA and the Illinois Pollution Control Board (IPCB) will be responsible for monitoring water quality. The IEPA will develop more specific water quality regulations for sediment pollution control and present them to the IPCB. Frank says the combined efforts of the two organizations will provide objective standards for determining water quality violations.

The Cooperative Extension Service in cooperation with the Department of Agriculture, soil and water conservation districts and other groups will carry out an expanded educational program. Soil conservation will be promoted through news releases, seminars and presentations.

Reclaimed Mined Land

Can Original Productivity Be Restored?

Illinois has the largest bituminous coal reserves in the nation — about 162 billion tons. According to a government study, coal companies will likely strip-mine 50 percent of the coal, affecting nearly 6 million acres of agricultural land.

As devastating as this figure may sound, University of Illinois Professor of Agronomy Ivan Jansen says mine land reclamation could restore — and possibly improve — land productivity. "We don't have an adequate research base to tell us at this point whether or not all land can be restored to original productivity. But we're quite confident some can," he says.

How the land is reclaimed depends on how it will be used following restoration. If the land is to be used for growing row crops, law requires that 8 to 18 inches of topsoil must be returned to the area along with the subsoil. Reclamation, however, should be site specific to achieve the best results, says Jansen. Restoration can improve soil drainage and chemistry in some soils if material from deep in the ground is mixed with the subsoil. This would be especially helpful in Southern Illinois where a hard claypan subsoil causes drainage difficulties, he says.

Although Jansen feels optimistic about land reclamation, he admits it's going to cost all of us money. Current legislation has allowed coal companies to pass increased operating costs on to power plants — as long as those costs are related to reclamation. This, in turn, makes electric power more expensive.

But Jansen points out that using our natural resources responsibly may be well worth the cost. "We must consider our ability to feed the nation's people. Will our food production capability be inadequate in the future? If this is a real concern, then I think we can go beyond the economic argument and justify reclamation costs."

Who Will Own Reclaimed Land?

Now that it appears reclaimed land can be used for intensive agriculture, more farmers are interested in owning that land.

With the passage of the Surface Mining Control and Reclamation Act in 1977, coal companies are now legally responsible for land restoration. What happens to the land following reclamation concerns farmers as well as the coal companies.

Lyle Sendlein, director of the Coal Extraction and Utilization Research Center at Southern Illinois Uni-

versity says coal companies likely will sell the land once it has been mined and restored. He says the coal companies will try to get as much as they can out of the land they buy. "If the land can be made productive so that it can be used for agriculture — they'll do it. But they probably won't want to get into agri-business, so they'll sell the land."

Sendelein says farmers are now more familiar with their rights and are getting fairer prices for the natural resources in their land. In some cases the farmer may retain ownership while the mining company temporarily uses the land to extract the coal. This, however, is rather unusual. Coal companies generally buy large tracts of land, he says.



Mismanaged Livestock Can Harm Water Quality

Livestock on pasture don't always cause water quality problems. Often, management techniques and surface water conditions are the real culprits.

According to Dale Vanderholm, University of Illinois Extension agricultural engineer, pastured livestock usually don't hurt the environment. But if they are poorly managed or concentrated near a stream, water quality damage may occur.

Under high-density situations, pastured livestock can strip areas of vegetative cover and compact the soil. This increases runoff, washing soil sediment, plant nutrients and oxygen-demanding organic material into nearby waterways, says Vanderholm.

Water quality problems also may occur when livestock have direct access to streams. A large number of animals using a stream for watering may contaminate it with fecal material and may erode the banks.

Although there are few documented cases of pollution caused by pastured livestock, Vanderholm says proper management could greatly minimize the potential for

water quality damage. He suggests farmers control runoff and prevent erosion by not overgrazing pastures. He also advises them to keep feed and mineral stations, alternate water supplies and shelters away from streams so good vegetative cover is maintained on stream banks.

Take Care When Applying Liquid Waste

Land application of livestock waste is one of the most economically and environmentally sound disposal methods for producers, says Dale Vanderholm.

Although spreading manure isn't a new idea, its handling and disposal have changed. Manure characteristics also are different — particularly in content and form of fertilizer nutrients.

Many farmers are moving towards liquid waste handling systems, says Vanderholm. But they often find that liquid manure doesn't always act as they expect. With proper equipment and some experience, handling liquid manure usually is only a small problem. But doing a good job of applying it to land and using its fertilizer content effectively — without causing pollution problems — often takes longer to master.

Vanderholm says to use manure in the most efficient and environmentally safe way, an accurate estimate of its fertilizer value needs to be made. Manure varies so much that only a periodic analysis of the manure can determine its fertilizer value accurately.

Many laboratories in Illinois, Indiana and surrounding states perform these analyses. The fee charged is usually insignificant compared to the money saved from more efficient fertilizer use.

Under normal conditions, the manure should not contain more nitrogen than the crop needs to produce a reasonable yield, says Vanderholm. But when applied to meet crop nitrogen needs, the crop can get too much phosphorus. To avoid phosphorus build-up, enough manure should be applied to supply crop phosphorus needs. Supplemental nitrogen can be added.

There are indications that excessive phosphorus accumulations in the soil may interfere with the crop's uptake of trace elements — causing yield reductions — in addition to causing water quality problems.

Vanderholm says farmers generally apply livestock waste to fields during the fall, winter and spring when time and weather permit. Some of this waste may be carried in runoff following a rainfall or snowmelt.

A laboratory study on the effects of liquid hog manure applications on runoff rates, erosion and nitrate loss, concluded that (1) applying liquid manure to a bare soil surface, as compared to bare soil with no manure added, can decrease runoff and the associated soil and nutrient loss from a given rainfall, (2) manure application increases percolation through the soil and (3) much of the benefit derived from the liquid manure is due to the stabilization of the soil surface that results from the crust formed during drying.

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For the producer, winter spreading offers several advantages, says Vanderholm. There's (1) less odor, (2) more time, (3) more acres available for application and (4) less soil compaction. But application of livestock waste on frozen ground can result in high nutrient losses under certain conditions.

Soil injection or incorporation during the fall or spring enables the manure to assimilate quicker into the soil — reducing the potential for surface water contamination from field runoff. It also reduces odors, adds Vanderholm.

Forests Fight Erosion

Forests effectively reduce erosion to natural, normal levels, says Ted Curtin, University of Illinois Extension forestry specialist.

Falling raindrops act like tiny bombs, gouging and splattering exposed soil. A rainfall of 2 inches per hour, is almost equal to 250 horsepower on an acre of land. This is sufficient force to lift the first 7 inches of topsoil 3 feet in the air 86 times. Curtin says trees, plants and the litter that covers the forest-floor help reduce rainfall impact and allow the water to infiltrate rather than run off.

A forest also acts as a sink, taking up sediment and debris and recycling nutrients.

A forest, therefore, can preserve and improve the water quality of a neighboring stream and should be carefully maintained.

Livestock Threaten Forest

Allowing livestock to graze forested areas may be detrimental to the forest and to water quality.

Curtin says livestock can damage tree feeder roots and destroy smaller woody and herbaceous vegetation. Grazed woodlands in Illinois often are a canopy of mature trees over bare soil — devoid of any undergrowth.

Without forest-floor vegetation, livestock can cause soil compaction and erosion. The impact this has on water quality depends on how near the forest is to a stream, adds Curtin.

A woodland may be a good place for holding cattle or farrowing sows but it is not a recommended woodland management practice. Fence livestock from woodland if timber production is the major objective.

If the woodland is not located in an area where excessive soil erosion and water pollution will occur, holding cattle in the woodland can be considered as alternate housing if timber production is not the objective.



Robert D. Walker

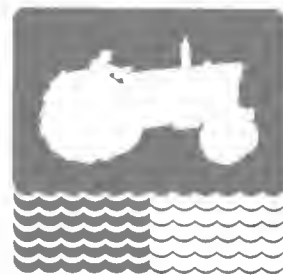
Robert D. Walker
Extension specialist
Natural Resources

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"208" Update for Agriculture

AGRICULTURAL ISSUES RELATING TO STATEWIDE WATER QUALITY PLANNING



Vol. 4, No. 1

July-November, 1979



Illinois 208 Plan Conditionally Approved

The U.S. Environmental Protection Agency (USEPA) has conditionally approved the Illinois 208 Water Quality Management Plan.

Jim Frank, Illinois IEPA (IEPA) agricultural adviser, says the plan will receive final approval when the IEPA meets the following 11 conditions.

The IEPA must develop schedules and programs for fiscal years 1981-1985 to assess the presence of instream heavy metals, as well as high nitrate concentrations in selected public water supplies. In addition, they must refine estimates measuring sediment generation, transport and delivery.

The federal agency also asks the IEPA to study sediment delivery in the Blue Creek watershed and the water-quality-impact of harvesting forests.

The USEPA questions the environmental soundness of applying animal waste to frozen ground. The IEPA, therefore, must prove that this recommended best management practice (BMP) is reasonable.

Other conditions to be met include evaluating the effectiveness and economic feasibility of BMPs, devel-

oping a priority system for ranking Rural Clean Water Program projects and reassessing target erosion control dates.

The USEPA approves of the regulatory and voluntary approaches taken in the plan as long as the IEPA can show annually that substantial erosion control steps are being taken. Any regulations recommended to and approved by the Illinois Pollution Control Board may be added to the plan only through formal amendment.

Because the 208 plan's success largely depends on the availability of technical assistance, the USEPA requires that each management agency send a letter of commitment to the IEPA.

In addition, the IEPA must assess the environmental, social and economic impacts of any component added to the plan.

In a letter to Illinois Gov. James Thompson, the USEPA commended the IEPA and 208 agriculture task force members for their work on the state Water Quality Management Plan. They said the work was one of the most comprehensive assessments of agriculturally related water quality problems in Region V and, perhaps, the nation.

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208 Plan "Misses The Boat"

Cropping and management practices on most farmland have little to do with the sedimentation problem, says Donovan Wilkin, University of Illinois assistant professor of landscape architecture.

Wilkin says 208 planners probably "miss the boat" when they say agricultural soil erosion is the principal contributor to in-stream sedimentation. He says they underestimate stream bank erosion and should concentrate equally on its control.

Wilkin and 208 planners blame intensive agriculture for the sedimentation of state streams. Row crops and overgrazing denude areas once covered with dense prairie vegetation.

But Wilkin differs from 208 planners when he says the problem results as much from the unrestricted movement of water, as it does from agricultural soil erosion in general.

"Before the Midwest was settled, water was trapped for months by vegetation. But now, with little to hinder its flow, we are sending the same amount of water downstream in a shorter period of time," he says. "These higher peak flows mean higher velocities, and higher velocities assisted by straightened and steepened stream channels mean more erosive power."

Channel erosion worsens when there's no vegetation covering the banks. Wilkin says soil erodes away in huge chunks when there are no roots to hold it.

Wilkin recognizes upland soil erosion as a major contributor to sedimentation but feels it's not as great a culprit as most think. He says 208 planners incorrectly assume that agricultural soil erosion—as predicted by the Universal Soil Loss Equation (USLE)—is an accurate indicator of sedimentation. The USLE was designed for and based on measuring the amount of sediment that reaches the bottom of a slope under specific land conditions. Wilkin says the equation can not be used as an accurate sedimentation measure because it doesn't take into account the redeposition of eroded soil on land.

Wilkin feels 208 planners should rethink their erosion control strategy and come up with a more efficient water quality program. He proposes restricting farming in flood plains and growing densely vegetated buffer strips along defined waterways. The buffer strips will trap upland erosion, detain water delivery to streams and stabilize stream banks.

He also suggests implementing upland soil erosion control practices on a priority system. Those closest to streams would be given aid first. This approach will affect fewer farmers and cost less than the present plan, concludes Wilkin.



FIGHTING EROSION

Thomas Schneider, ASC county executive director; Robert Hayward, Brown County Extension adviser and Eugene Nichols, SCS conservationist examine a field terraced with ACP project funds. Nichols says fields needing terraces are given priority for funding.

Illinois County Fighting Erosion

Brown County is fighting to maintain its soil quality.

"We're losing about 10 tons of soil per acre per year through wind and water erosion," says County Extension Adviser Bob Hayward. "In some places we're down to subsoil."

But this west-central Illinois county is trying to solve its severe soil and water conservation problems. It's one of 10 areas in the nation involved in a special agricultural conservation program (ACP) for small farmers. The project area covers 3½ townships.

The program was started in 1978 by the United States Department of Agriculture (USDA) and is administered by the Agricultural Stabilization and Conservation Service (ASCS). Under the ACP project terms, the Soil Conservation Service provides technical assistance for erosion control management practices. Farmers receive cost-share money from the federal government.

Hayward says the program will strengthen and improve rural economic conditions. Nearly two-thirds of the project area's 340 farms are currently involved. These farms are small—averaging only 200 acres.

Rough terrain leaves less than half of the farmland tillable. The rough portion must be kept in timber or pasture.

"This program will add to farm income through the soil it saves," says Hayward. "Some of the farmers now sell less than \$20,000-gross farm products a year. They would never have been able to install soil-saving practices without government cost-share funds."

Participating farmers earning \$20,000 a year gross income or less receive 90 percent in cost-share payments. Those earning more get 80 percent.

Brown County has received \$620,000 in ACP money. Hayward says the county spends most of the money for parallel tile outlet (PTO) terraces which successfully control erosion in the area. Other practices financed are grass waterways, diversions structures, ponds and pastures. In addition, conservation cropping and tillage systems are being promoted.

Overall, Hayward is pleased with the response to the program. "Of course there are a few people resisting our efforts," he says. "But I'd say our biggest problem is keeping up with the demand for assistance. We've got more people asking for help than we have money," he concludes.

Kansas Coal Company Asked To Help

One of the largest stumbling blocks facing the Brown County conservationists appears to be a coal company.

The company owns 6,000 of the 68,000 acres involved in the county ACP project. The Kansas-based company plans to strip-mine the area in the future. Currently, however, most of the land is cash rented.

Eugene Nichols, district conservationist for the Soil Conservation Service, says the acreage is highly erosive, losing at least 10 tons of soil per acre per year.

The local Soil and Water Conservation District (SWCD) wrote the coal company volunteering to help them control the erosion. "But that was a year ago last January and there has been no reply yet," says Nichols.

The District also has tried to talk with the company farm manager, Steve Plank, who visits the area twice a year. Nichols says, "he's hard to contact."

Plank has been working for the coal company since January. He says he has never seen the SWCD letter.

"If there are any specific erosion problems on our property we would be glad to talk to the District about them," says Plank.

He says he isn't aware of an erosion problem. "We have some good and some bad properties. But none of them seem to be managed any differently than surrounding farms."

It would cost the Kansas coal company about \$1.2 million to add erosion control practices on the 6,000 acres, says Nichols. Half the land is planted in crops — the other half in pasture and timber. He says PTO terraces, structures and ponds would be needed to reduce erosion to 5 tons per acre per year.

"It might be difficult trying to get the company to add conservation practices," says Nichols. "After all they'll have to tear everything out when they strip-mine.

But the District board is willing to work with the coal company at any time."

Plank says there are no plans to mine the area at present.

A Little About The ACP . . .

The Agricultural Conservation Program (ACP) is a joint effort by agricultural producers and the government to preserve and protect environmental resources.

The program is available to any U.S. farmer or rancher who needs cost-share assistance to control erosion and sedimentation, improve water quality and conserve wildlife habitats.

The Agricultural Stabilization and Conservation Service (ASCS) directs the ACP. State and county ASCS offices administer the program at the local level.

Congress annually authorizes ACP funds. The Secretary of Agriculture determines the amount each state ASCS office receives, based on individual state soil and water conservation needs. Then, the state office allocates the funds to county ASCS offices who use the money to help area farmers solve their conservation problems.

Farmers get technical assistance from the Soil Conservation Service, the State Foresters, the County Cooperative Extension Service, and others.

Farmers interested in receiving ACP cost-sharing must file a request with the county ASCS office prior to starting a practice. The recommended conservation practices must meet local needs and standards to qualify for funding.

Conservation Ethic Called For

It will take more than legislation to induce farmers to practice soil conservation management, says Raymond Cragle, Illinois Agricultural Experiment Station director.

Cragle says a conservation ethic must be promoted in the state. Many farmers are not aware that they have an erosion problem because their land remains productive.

"You can't go out and dictate this type of thing, it has to be a common thought," he says. "We have to try and convince Illinois farmers that there is an erosion problem and that it produces harmful socio-economic effects."

But Cragle admits that convincing farmers won't be easy. "In some areas farmers are practically mining the soil," he says. "They've been able to abuse the soil and temporarily delay the consequences by replacing some of the lost nutrients with inexpensive fertilizers."

But with rising petro-chemical costs, the days of inexpensive fertilizer are gone. And even if they weren't, Cragle says some Illinois land already has eroded down to less productive profile soils that no amount of fertilizer could improve.



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To increase public awareness of the state's erosion problem and its solution, Cragle proposes a combined Experiment Station research and Cooperative Extension Service education program. The program will address the short and long term effects of soil loss.

"We have to try to impress farmers with what soil loss is costing them now in yield and machinery maintenance and fuel costs - and what it will cost future generations," he concludes.

Drainage Cuts Costs And Erosion

Well-drained land cuts crop production costs as it reduces soil erosion, says Carroll Drablos, University of Illinois Extension soil and water specialist.

Drablos says good drainage not only saves soil by reducing surface water runoff, but also enables farmers to grow crops with fewer seedbed problems and less labor.

Drainage problems arise from a high water table or when excess rainfall ponds on the soil surface, he says. Wet fields reduce the number of available in-field workdays, making it difficult for farmers to plant, cultivate or harvest. Therefore, farmers need larger high-powered equipment - and a bigger machinery investment - to get the job done.

Drablos says well-drained land increases the number of spring workdays. Because crops get in the ground earlier, less cultivation is needed to control weeds, too. And there's no need to work a too-wet field which can reduce yields on heavy soils, he adds.

By lowering the water table, proper drainage aerates the soil. Aeration provides a more favorable root en-

vironment for plants by allowing carbon dioxide and oxygen to move through the soil, says Drablos.

He says drainage also can increase soil temperature at the surface from 2 to 4 degrees F. This warmer temperature can increase plant growth as much as 10 percent.

Drablos says good soil structure is the key to proper drainage. If a soil remains saturated, the normal wetting and drying cycles with consequent shrinking and swelling action is absent. Good drainage is necessary because soil structure can be adversely affected if tillage or harvesting operations are done when the soil is too wet.

Yield response from improved drainage is extremely difficult to measure, says Drablos. Drainage benefits, in economic terms, have been demonstrated in a 10-year study in Ohio where drain tile were spaced 40 feet apart and 3 feet deep. The study showed that drainage benefits over costs averaged \$50 per acre per year when corn was valued at \$2 per bushel. Corn yield increase, due to improved drainage, averaged 40 bushels per acre per year. However, crop yields may vary considerably depending on location, soil type, weather and management practices, concludes Drablos.

Robert D. Walker

Robert D. Walker
Extension specialist
Natural Resources

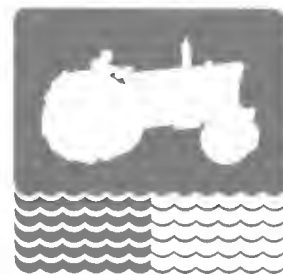
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"208" Update for Agriculture

AGRICULTURAL ISSUES RELATING TO STATEWIDE WATER QUALITY PLANNING



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Terraces: Saving Soil With Soil

Now that the agricultural portion of the 208 Water Quality Management Plan is approved, many farmers will be busy trying to control soil erosion on their land. And for some, that might mean building terraces.

Terraces are a combination of earth embankments and channels that help reduce soil loss by intercepting runoff water before it reaches eroding velocity. Terraces can effectively control erosion when they are used in combination with conservation practices.

Carroll Drablos, University of Illinois agricultural engineer, says terraces are of value on many soils, but that they may not always be practical to build because of land steepness. As land slope increases, so does soil loss from erosion. However, Drablos says terrace construction and maintenance costs also increase to the point where these costs outweigh the benefits. Irregular topography or too slight a slope also restrict terracing, he adds.

Three Objectives

In order to control erosion successfully and satisfy farm operator needs, terraces must meet three objectives, says Drablos. Terraces must (1) control erosion, (2) be farmable and (3) improve farm topography.

Erosion control is the primary objective of terracing and requires careful planning. Drablos says the soil loss tolerance limit and the level of farm management must be considered.

A terrace system's soil erosion control benefits will be lost, however, if a farmer won't accept or maintain the system because it's not farmable, he says. A farmable terrace system should be parallel wherever possible to reduce point rows, be spaced to fit farm machinery, be workable and provide good access roads to all parts of the field.

To improve field topography, terraces are laid out fairly straight and smoothly across minor draws and gullies, says Drablos. Soil dislodged by rain or machinery will deposit in low areas, thereby leveling the field and making it more farmable.

Terrace System Types

There are two major terrace system types. One is the gradient terrace system and the other the level terrace system. Drablos says soil characteristics and the amount of yearly rainfall determine which terrace layout is used.

Gradient terraces carry collected runoff water in a graded channel to a surface or subsurface outlet. Sur-

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face outlets are either natural or constructed waterways. Subsurface outlets are underground conduits made of tile or pipe.

Drablos says gradient terraces that use grass waterway outlets are a common type of terrace. He says they control erosion by reducing the field slope length to the terrace spacing. When there is runoff, the water flows overland towards the terrace and then along the terrace channel at a non-erosive speed to the waterway outlet. The location of the outlet will depend primarily on topographical features and farm operator convenience.

Grass waterways may have either uniform or variable grades. However, Drablos says grades should be steep enough to provide good drainage and adequate flow without scouring the waterway and washing out crops. Grass waterways must be maintained in good vegetative cover to keep gullies from developing, he says. Gullies that form in an outlet could ruin the entire terrace system.

Gradient terraces using underground outlets are adapted to low to moderately permeable soils, says Drablos, and particularly adapted to areas where waterways are shallow and numerous.

This type of terrace system has outlets that are conduits made of tile, tubing, pipe or other suitable material. Like all gradient terraces, the terrace channel is graded to the outlet, says Drablos. However, the terrace ridgetop usually is built level for runoff storage.

Water enters the conduit through an intake placed in the terrace channel. Drablos says the outlet conduit is designed to remove the runoff gradually, but at a fast enough rate to prevent crop damage.

Drablos says there are two main advantages to using underground outlets. First, they promote parallel alignment. These terraces can be built directly across shallow depressions, forming a straighter line than waterway outlets. And straighter lines are easier to parallel, he says.

The second advantage is that grass waterways can be eliminated, so more land is available for crop production. Drablos points out, however, that installing tile outlets may cost more than installing surface outlets in natural waterways.

Another advantage of using underground outlets is that it helps restore land and improves topography. Drablos says if natural waterways are deep, placing an intake at the low points with a fill straight across the waterway will trap sediment that moves. This will eventually level out the area and provide a more farmable land surface.

The level terrace is used both for erosion control and water conservation. It is generally used in areas where it's difficult to establish an outlet and where runoff from the area must be kept to a minimum or entirely eliminated, says Drablos. It is particularly adapted to areas of low rainfall for conserving moisture.

A level terrace is constructed without channel grade.

The channel and ridgetop are built level so that runoff is stored in the terrace channel along the terrace. The ends of the terrace usually are closed; therefore, the soil absorbs the water and serves as the terrace outlet. Level terraces need a fairly large cross section of land because they have large storage requirements, he adds.



RESHAPING FOR EROSION CONTROL

Bulldozer in field scoops up earth to build terraces. Terraces reduce soil loss by intercepting runoff water before it reaches eroding velocity.

SCS Estimates Cost To Terrace

Terraces are costly to build. So landowners should carefully plan their terrace systems.

The Soil Conservation Service has these cost estimates for terrace construction. These costs are state averages based on earth moving costs of \$0.65 per cubic yard. These figures may vary according to geographic regions and conditions.

The average cost for a broad base gradient terrace (not including the cost of a waterway outlet) varies from \$41 to \$262 per acre for slopes ranging from 1 to 6 percent.

Because grass backed terraces are built only on highly sloped land, they are more expensive to build. It costs about \$180 per acre to construct a grass backed terrace on land with a 6 percent slope and \$673 per acre on land with a 15 percent slope.

Tile outlet terraces cost considerably more to build. However, the tile outlets are included in the price. Broad base terraces cost from \$144 to \$634 per acre on land with slopes ranging from 1 to 6 percent. Grass backed terraces will cost about \$436 per acre at a slope of 6 percent up to \$968 at a slope of 15 percent.

Terrace system costs decrease as the spacing between terraces increase. Increased terrace spacing, however, may require additional conservation and tillage practices to keep soil loss within tolerable limits.

Illinois' Most Popular Terraces

Two of the most commonly used terrace cross sections in Illinois are the grass backed and the broad base, says Drablos.

Terraces are made up of three side slopes. Together, the cut, front and back slopes form the terrace cross section.

The grass backed terrace is recommended for land with a slope of 6 percent or more. Because the back slope is constructed on a 2:1 slope, it is too steep to farm and therefore it's maintained in sod. The front slope is made to fit the farm equipment. The cut slope is made at least as wide as the front slope, so it too is farmable.

The broad base terrace is generally adapted to land slopes less than 6 percent. Their main advantage over grass backed terraces is that they are more farmable. The front slope is made the size of the machinery width. The cut slope and back slope also are built at least that size. This enables the operator to farm the entire cross section. This isn't possible with the grass backed terrace.

Energy Savings Slight With Reduced Tillage

Conservation tillage can reduce energy consumption slightly — but only slightly. Its real value lies in saving soil, says John Siemens, University of Illinois agricultural engineer.

Conservation tillage leaves plant residues on the soil surface to reduce erosion. Compared to conventional tillage, conservation tillage usually means performing

fewer tillage operations or changing to operations with lower power requirements.

Of course, less fuel is required when field operations are omitted or when the operations used have lower power requirements, says Siemens. But when a farmer changes his tillage system, the change also affects his need for other energy inputs, such as pesticides, fertilizer and machinery.

Siemens says fuel consumption for field operations varies with soil type and condition, equipment adjustment and the operator. Table 1 lists estimates of fuel requirements for four tillage systems. The estimates include only the fuel required for actual field work. No allowance is made for machine preparation or travel to and from the field. Because fuel consumption varies, actual fuel requirements may deviate as much as 35 percent from the values listed in the table, adds Siemens.

Once a farmer decides what field operations he will use in a tillage planting system, he can estimate the total fuel requirements with reasonable accuracy. Significant fuel savings result when tillage is reduced (See Table 1).

Little information exists on how much energy is used in manufacturing different types of farm equipment. But this energy should not be ignored in considering how much energy agriculture uses or in projecting savings from reduced tillage, says Siemens. When the number of field operations is reduced, or the operations used require less power, the on-farm complement of equipment can be reduced.

According to Siemens, researchers at Purdue University have estimated the energy used to manufacture and repair farm equipment. Their studies show this

Table 1. Estimated Fuel Needed for Field Operations with Four Tillage Systems in Gallons Per Acre

	Moldboard Plow	Tillage System		
		Chisel	Disk	No-Till
Disk .....	.5	.5	—	—
Apply P and K.....	.15	.15	.15	.15
Moldboard Plow	1.90	—	—	—
Chisel	—	1.20	—	—
Disk .....	.70	.70	.70	—
Apply Nitrogen .....	.60	.60	.60	.15
Apply Herbicide and Disk.....	.70	.70	.70	—
Field Cultivate .....	.70	.70	.70	—
Plant .....	.45	.45	.45	.50
Apply Herbicides ...	—	—	—	.10
Cultivate .....	.45	.45	.45	—
Harvest	1.6	1.6	1.6	1.6
Total	7.75	7.05	5.35	2.50

Table 2. Energy in Typical Herbicide Programs with Four Tillage Systems

Tillage System	Herbicide	Herbicide Rate	Diesel Fuel Equivalent
		Lbs./Acre	
Moldboard Plow..	Broadleaf	1.5	.75
	Grass	2.0	1.00
			Total...1.75
Chisel	Broadleaf	1.75	.88
	Grass	2.25	1.13
			Total...2.01
Disk	Broadleaf	2.0	1.00
	Grass	2.5	1.25
			Total...2.25
No-Till	Broadleaf	2.0	1.00
	Grass	2.5	1.25
	Contact	.5	.63
			Total...2.88



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energy equals about 4.0 gallons of fuel per acre for conventional tillage, 3.6 gallons per acre for chisel tillage, 2.8 gallons per acre for disk tillage and 1.3 gallons per acre for no-till.

No-plow tillage systems often require higher herbicide application rates to achieve acceptable weed control (See Table 2). Moldboard plowing can bury many of the weed seeds so deep that the seeds don't germinate and weed problems are reduced. But with chisel, disk, and no till, weed seeds remain on or near the soil surface, says Siemens. Also, herbicides may be less effective because of the plant residue on the soil surface. He says more insect and rodent control chemicals may be needed with no-till, too.

Most research indicates phosphorus, potassium and lime requirements stay the same with different tillage

systems. Nitrogen, however, is by far the largest single energy input for corn production. Siemens says some research indicates higher nitrogen requirements for no-till corn production. If this proves to be the case, no-till corn production would be at a serious disadvantage because producing nitrogen fertilizer requires a lot of energy, he says.

Nitrogen fertilizer in the form of anhydrous ammonia requires less energy to manufacture than other forms of nitrogen fertilizer (See Table 3). Therefore, Siemens suggests farmers use anhydrous ammonia to reduce the energy needed for corn production.

Table 4 lists the energy requirements for fuel, machinery, herbicides and nitrogen—the inputs most likely to vary as tillage systems for corn production change.

Table 3. Energy Used in Production, Transportation and Application of Nitrogen Fertilizer in Gallons Per Acre

Form of Ammonia	Diesel Fuel Equivalent
Anhydrous Ammonia	27.18
Urea Solution	35.10
Urea Solid	35.29
Ammonium Nitrate Solution	33.09
Ammonium Nitrate Solid	37.44

Table 4. Estimate of Energy Used in Gallons Diesel Fuel Equivalent Per Acre for Tillage, Herbicides and Fertilizer for Corn

Tillage System	Fuel	Machinery*	Herbicides	Nitrogen	Total
Moldboard Plow	7.75	4.0	1.75	27.18	40.68
Chisel	7.05	3.6	2.01	27.18	39.84
Disk	5.35	2.8	2.25	27.18	37.58
No Till	2.50	1.3	2.88	27.18	33.86
				to 37.44 ^b	to 44.12 ^b

* Includes energy estimates for manufacturing and repairing machinery

^b Depending on the form of nitrogen used

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Robert D. Walker

Robert D. Walker
Extension specialist
Natural Resources



"208" Update for Agriculture

AGRICULTURAL ISSUES RELATING TO STATEWIDE WATER QUALITY PLANNING



Vol. 4, No. 3

March-April, 1980

USDA Seeks Input On Conservation Strategies

Every year, topsoil on an estimated 241 million acres of farmland erodes faster than it can be replenished.

The Soil and Water Resources Conservation Act of 1977 (RCA) was designed to meet this and other natural resource problems.

The RCA directed the U.S. Department of Agriculture (USDA) to develop a program and policies for soil and water conservation in the United States. What follows is a sketch of the USDA's analysis of the problems, its goals and some of its proposed strategies.

A 60-day public review period on the USDA's proposed strategies started on January 28, 1980 and will end March 28. Mail written comments to: Response

Analysis Center, P.O. Box 888, Athens, GA 30603. In addition, most Illinois counties plan to hold a public meeting in March to discuss the proposals.

The purpose of the review period is to permit the public to study the natural resource problems, proposed program objectives, and proposed strategies and to express opinions on the kind of program they want. The USDA will use the information to develop a program which will be submitted to the President in 1980. A more extensive report will be made in 1985.

The following information has been extracted from materials provided by the USDA. A complete set of the materials is on file in each Soil Conservation Service (SCS) office in the state. These include "Appraisal 1980, Review Draft Part I, and Part II" and "Pro-



Soil conservation: It's in your hands.

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Acres where wind and water erosion are greater than 5 tons per acre per year, 1977. One dot equals 30,000 acres. A total of 241 million acres suffered erosion over 5 tons per acre per year.

gram Report and Environmental Impact Statement - Review Draft 1980." The USDA also developed a summary of these materials. A limited number of summaries are available at SCS offices.

Background: Total Land and Water

The Resource Conservation Act only deals with land in private ownership, which amounts to 1.5 billion acres (about 2/3 of the total U.S. land, excluding Alaska and Hawaii). According to the Natural Resources Inventories, which was conducted by the Soil Conservation Service in 1977, the 1.5 billion acres are divided as follows:

- 413 million acres of cropland.
- 548 million acres of grazing land (this includes 131 million acres of pasture and native pasture and 414 million acres of rangeland).
- 377 million acres of forest land.
- 175 million acres for other uses (including urban and nonfarm rural development, highways, air ports).

Assumptions and Projections

In analyzing and evaluating soil, water and related resources for RCA, the USDA looked ahead to the years 2000 and 2030.

It examined three scenarios projecting future levels of demand for agricultural products. These projections were based on assumptions about the future - population, technological change, the economy, energy supply and environmental concerns.

The ability of agriculture to meet the public demand in the years 2000 and 2030 will primarily be determined by the quantity and quality of soil and water resources and the level of technology.

In turn, the demand on soil and water resources will be determined primarily by the population level, the living standards of the population and the volume of exports.

The U.S. population was 215 million in 1976 and, in its scenarios, the USDA assumed the population would increase to 260 million in the year 2000 and to 300 million by 2030.

The USDA also estimated that per capita disposable personal income, in terms of 1972 dollars, would increase from an average of \$4,148 in 1975-77 to \$7,640 in 2000 and \$13,779 in 2030. The percentage of disposable income spent on food was projected to rise slightly from the 1975-77 average of 16.8 percent to 17.5 percent in both 2000 and 2030.

Scenario one assumed that total demand for agricultural products in 2030 would be 107 percent of actual production in 1977. Scenario two assumed domestic and export demand in 2030 would be 142 percent of actual 1977 production and scenario three assumed demand in 2030 would be 172 percent (see Table 1).

The Seven Problem Areas

The USDA analyzed data relating to seven separate problem areas and developed proposed objectives, specific activities and estimates of costs to carry out the objectives for each.

Table 1. — Economic Indicators projected to 2030

Economic Indicator	1975-77	2000	2030
	Average		
U.S. Population (millions).....	215	260	300
Per capita disposable income (1972 dollars)	\$4,148	\$7,640	\$13,779
Percentage of disposable income spent on food	16.8	17.5	17.5
Export Index, Scenario 3 1967 = 100)	169	290	351
Agricultural Productivity Index (1967 = 100)	116	147	187

The seven areas are: soil resource quantity and quality, water quality, water supply and conservation, fish and wildlife habitat, upstream flood damages, energy conservation and production and related natural resources. Related natural resources includes organic wastes, urban soil and water management and recreation.

Soil Resource Quantity and Quality

The use of the nation's nonfederal land is changing. The acreage of cropland and forest land is decreasing while the acreage of pasture land, native pasture and rangeland is increasing. Also, the acreage of urban, nonfarm rural development and transportation land is increasing at a growing rate.

In 1977 there were 413 million acres of readily available cropland in the United States. By 2030 it is estimated that 48 million cropland acres may be lost to other uses, leaving 365 million acres available for production.

To offset the loss, there presently is an estimated 135 million acres of primarily pasture and forest land that could potentially be used as good to medium cropland. In addition, new technology and improved drainage on poorly drained land now in production could increase yields to help further offset the loss. Improved drainage could particularly help increase yields in Illinois.

But soil erosion may decrease the productivity of a soil if it occurs at a rate faster than new topsoil can be replenished by natural processes. Generally, topsoil can be replenished at an annual rate of 3 to 5 tons per acre on cropland.

The total damage from soil erosion, either in terms of soil production lost, has not been calculated. When erosion reduces crop yields to unprofitable levels, a farmer may convert his cropland to pasture or forest and switch pasture land to crops to make up for the loss. This makes it hard to estimate total damage.

The National Resources Inventories show that 97 million acres of cropland, about 25 percent, has water erosion exceeding 5 tons per acre per year. Wind erosion exceeding 5 tons occurs on another 44 million acres, making a total of 141 million acres of cropland — or 34 percent — with excessive soil erosion.

Approximately 11 percent of the pasture land and 4 percent of the forest land has erosion exceeding 5 tons per acre per year. We can safely assume a decrease in

yields, unless offset by technology, on land that has excessive soil erosion. This decrease could range from 5 to 20 bushels of corn per acre, depending on the depth and type of subsoil.

Land best suited to producing food, forage and fiber is called prime farmland. It has the soil quality, growing season and moisture supply to produce a sustained high yield of crops, with a minimum of energy input and soil erosion.

There are about 346 million acres of prime farmland in the United States. Nearly 25 percent is in the five cornbelt states. Not only are crop yields higher, but production costs are lower on these soils.

Proposed goals:

1. Maintain conditions on lands where soil erosion is less than 5 tons per acre per year.
2. Utilize cost effective methods to bring soil erosion below 5 tons per acre per year on all other agricultural land.
3. Maintain soil quality with regard to tilth, infiltration capacity, organic matter and composition.
4. Improve conditions on overgrazed rangeland.

To meet these goals, the USDA proposes these actions:

- Collect reliable data on soil and water resources at the county level for the 1985 RCA report.
- Provide land users with information to evaluate their conservation needs and provide assistance to solve the problems.
- Help land users maintain existing conservation systems.
- Concentrate efforts on cropland where excessive soil erosion now occurs (141 million acres). Because erosion may be so bad on some land, up to 17 million acres may have to be removed from cultivation.

The total cost to meet these soil conservation objectives is estimated at \$103 billion over the next 50 years. These costs may be covered by private landowners and operators; local, state or federal programs; or a combination of sources.

Water Quality

Public opinion surveys consistently indicate concern about water pollution and a willingness to pay for its control. Surveys indicate that water pollution adversely

Table 2. — Sheet, rill and wind erosion on nonfederal agricultural land in 1977. Acres of rural land by erosion rate, in tons per acre per year.

	(1,000 acres)		
	Less than 5 tons	5-13.9	14+
Cropland	272,224	93,053	48,000
Pasture land	119,021	9,485	5,062
Forest land	353,047	11,721	4,895
	Less than 2 tons		
	Less than 2 tons	2-4.9	5+
Rangeland	283,478	55,501	68,882

affected 95 percent of the 246 drainage basins in the U.S. in 1977.

Sources of pollution include point sources and rural and urban nonpoint sources. Industrial and municipal discharges are the main sources of point source pollution.

Nonpoint source pollutants now account for more than half the pollutants entering the nation's waterways. Nonpoint source pollutants from agriculture include pesticides, organic wastes, nutrients, dissolved solids and sediment.

Proposed objectives:

1. Approach zero discharge of toxic pollutants into water.
2. Reduce the levels of dissolved solids entering the nation's streams.
3. Reduce agricultural nutrients reaching the water by 30 percent by targeting assistance to critical areas.
4. Reduce sediment reaching streams, lakes and harbors.
5. Minimize pollution caused by organic waste.

To meet these goals, the USDA is considering these actions:

- Encourage the use of alternative chemicals and resistant crop varieties.
- Emphasize the proper amount, timing and placement of fertilizers and pesticides.
- Use runoff and erosion control measures to control pollutants that are carried by soil particles.
- Install animal waste control measures.
- Develop new cost effective nonpoint source pollution control methods and teach landowners how to use them.

Meeting water quality objectives would cost approximately \$19 billion over the next 20 years.

Water Supply and Conservation

Agriculture is the single largest user of water in this country. Irrigation alone accounts for 81 percent of all the water consumed in the U.S.

The USDA estimates that 78 percent of diverted irrigation water reaches farms and 53 percent of water that gets to the farm reaches the crop.

This means 11 percent of irrigation water is actually utilized by the crop. Water that doesn't reach the crop is lost through evaporation, soil absorption or through other means.

But this is not a major Illinois problem. Nearly all of the USDA's proposals and objectives for water conservation apply to Western states that rely on irrigation.

Water conservation objectives would cost an estimated \$61 billion over the next 50 years.

Fish and Wildlife Habitat

Some species of wildlife have declined in recent years

as farms increase in size and farmers turn to more intensive cropping.

Over the past 23 years, wetlands have been lost at a rate of 510,000 acres a year. This rate declined to about 300,000 last year with agriculture accounting for two-thirds of that total.

Fish habitats in streams and farm ponds are degraded by nutrients, pesticides and sediment.

Proposed objectives:

1. Reduce the loss of wetlands.
2. Increase stream water flow.
3. Improve upland wildlife habitat.

To meet these objectives, the USDA proposes the following:

- Determine what type of wetlands remain, where they are and what their relative values are.
- Preserve existing wetlands and restore other wetlands through land rental or other means.
- Change any federal policies that result in wetland destruction.
- Develop wildlife habitat management criteria and help install wildlife management systems on crop, range and other land.

Meeting fish and wildlife objectives within 50 years would cost approximately \$6.7 billion.

Upstream Flood Damages

Flood damages to cropland, pasture land, urban land and other properties in upstream areas were over \$1.7 billion in 1975.

By the year 2000, estimated annual damages are expected to increase to about \$2.3 billion. Damages to cropland and pasture land account for \$1.074 billion — 65 percent of the 1975 damages — and occurred on more than 85 million acres.

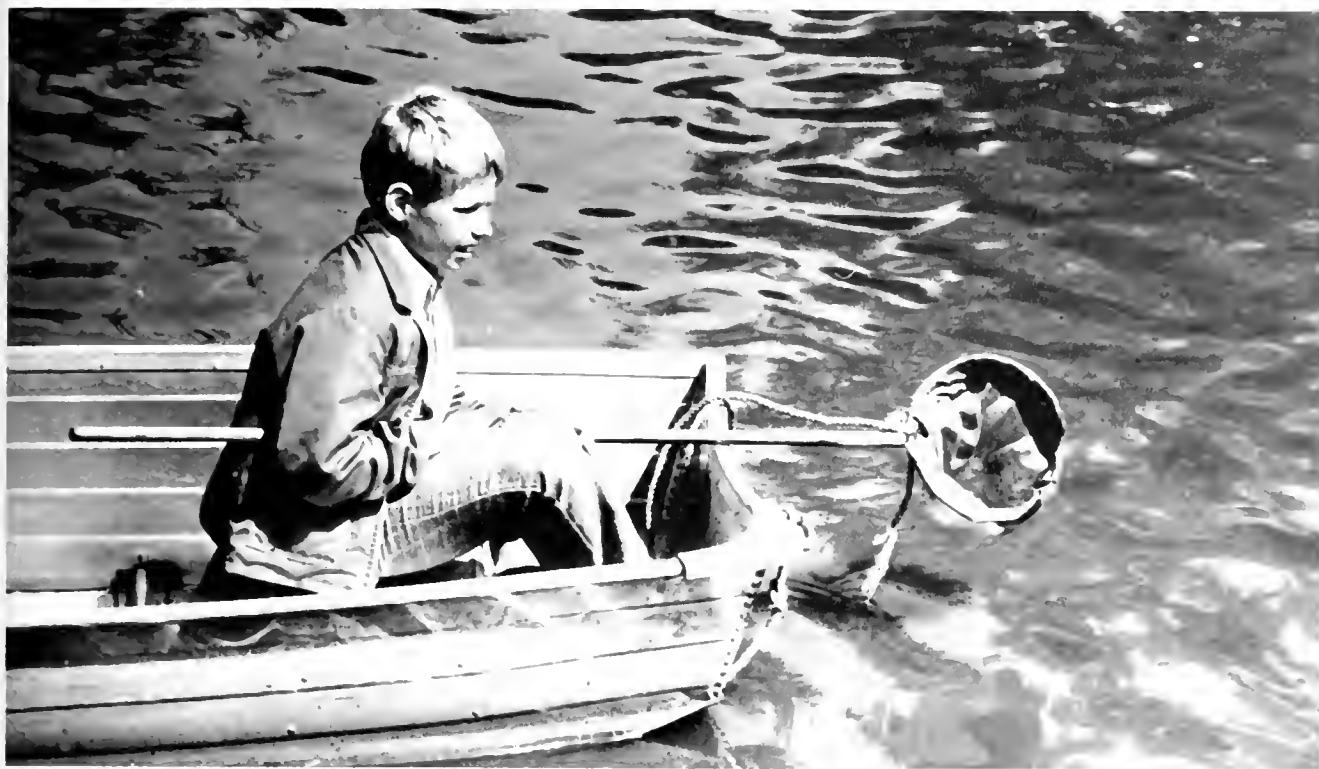
Proposed objectives:

1. Reduce upstream flood damages 16 percent using available structural and non-structural methods. Structural methods include such strategies as building dams; non structural methods control flood water with soil conservation and drainage practices.
2. Develop new technology where practical to reduce damages more than 16 percent.
3. Prevent loss of wetlands and prime agricultural land.

To prevent upstream flooding, the USDA is considering these plans:

- Develop and implement 20 small watershed flood control projects each year and 150 flood hazard studies per year for 20 years.
- Implement 25 non-structural projects in the 1980's to develop and list new technology.

It would cost \$3.8 billion over the next 20 years to reduce flood damages.



Water is a source of nourishment and recreation — if it's clean.

Energy Conservation and Production

Although agriculture consumes only 2.9 percent of the total energy used in the U.S., the potential for energy savings on farms is still substantial. Even more substantial is the possibility for production of energy from agricultural products.

The goal of agriculture is energy self-sufficiency by 1990. It can be met if we direct our efforts to practicing more energy conservation and researching ways to produce energy with minimum damage to soil and water resources.

Proposed objectives:

1. Reduce energy use in agriculture.
2. Increase net energy production on agriculture land, consistent with soil and water conservation principles.

To meet energy objectives, the USDA makes these proposals:

- Encourage crop drying methods that use forms of energy other than fossil fuels.
- Step-up research and information on efficient fertilizer use, improved irrigation management and establishment of shelter belts.
- Develop technology for converting biomass to usable energy and encourage more legumes as sources of nitrogen.

Meeting energy conservation objectives in 10 years would cost about \$11.2 billion.

Related Natural Resources

About 23 percent of the nation's sewage sludge and

sewage effluent is now spread on land. As the volume of urban wastes increases by an estimated 25 percent in the next 10 years, even more solid waste and effluents will probably be spread on land.

Nearly 3 million acres are converted to urban and nonfarm rural development annually, including about 1 million acres of prime farmland and 875,000 acres of soils that are wet or susceptible of flooding. Soil erosion increases greatly during construction when land is converted to urban uses. The sediment may damage streams and lakes.

Proposed objectives:

1. Increase the use of organic waste on agricultural land.
2. Reduce downstream flood losses and sediment from construction sites.
3. Reduce the loss of prime and unique farmland to urban uses.

To meet these goals, the USDA is considering these actions:

- Increase research on organic waste applications.
- Improve instruction on new technology.
- Develop and implement improved waste management systems.
- Work with state and local agencies to help guide development towards areas where it would be compatible with natural resource protection.
- Develop and implement sediment control activities.

The cost to meet these goals is estimated at \$17.7 billion dollars over the next 50 years.

The Seven Strategies

To meet these proposed goals, the USDA also has come up with seven proposed strategies. These can be used either separately or in combination. They attack the problem from different angles, proposing everything from penalties for farmers who don't apply conservation measures to rewards for those using acceptable conservation methods.

It was necessary to drastically condense USDA materials on these seven conservation strategies. So here they are, in bite-size pieces. For more information, contact the nearest Soil Conservation Service office where more material is available.

Cross-Compliance

This approach means farmers who don't carry out acceptable soil conservation measures would not be able to receive help from other USDA programs.

For example, a farmer would have to use conservation measures acceptable to the USDA before he could get a commodity loan, crop insurance, a low-interest loan or other assistance from USDA programs.

The cost of solving resource problems could either be borne by the farmer alone or by the farmer with technical assistance from the USDA.

The most obvious cross-compliance link would be between soil and water conservation and commodity

programs. USDA commodity programs provide the farmer with income and market protection while ensuring reasonable prices for consumers.

The Conservation Bonus

Under this system, farmers doing an adequate job of soil conservation would be certified as conservation managers. This would entitle them to monetary rewards tied to existing USDA programs.

For example, a conservation-minded farmer might receive higher commodity price supports, increased cost sharing or more favorable loan interest rates. The amount of the bonus would depend on the amount of conservation practices used by a farmer. If the farmer removes his conservation practices, his certification for bonuses could be withdrawn.

To implement this alternative, the USDA would work with local officials. The USDA would determine where soil resource problems pose the greatest threat to food and fiber production; these areas would receive priority for bonuses.

Regional Resource Projects

This would focus attention on specific regional problems. If a proposed regional project meets the USDA's national conservation objectives, then it qualifies for



Crop residue will help reduce soil erosion on farmland.

USDA funding. The USDA would provide guidelines for setting up these regional resource projects.

This doesn't mean the USDA would form new federal agencies, such as the Tennessee Valley Authority; existing organizations and agencies would be used. It also doesn't mean the USDA's nationwide conservation work will be eliminated. But national emphasis would be reduced to allow more money and manpower to shift to regional concerns.

The USDA would continue to provide assistance on erosion control, water conservation, flood control and other resource problems outside the designated regional project areas.

Regulations

This option, which may be the most stringent of the seven, would make soil conservation mandatory.

The USDA would work through state legislatures and local governments to set and enforce conservation regulations. The regulations, phased-in over 20 years, could include setting limits on soil erosion, protecting prime farmland from development, preventing the drainage of wetlands and reducing agriculture's energy dependence on fossil fuels.

Land users failing to comply with regulations might be penalized with a fine or tax.

The USDA would provide grants and other assistance to states and local governments that enforced such regulations. It would deny conservation assistance to states failing to develop acceptable standards and enforcement procedures.

The USDA also would be prepared to provide increased financial aid to landowners who must follow these regulations. This might be done through grants, low interest loans and higher levels of cost sharing.

If a landowner uses USDA assistance to develop conservation systems, but fails to maintain them, he must reimburse the government for assistance.

Three states already have laws requiring landowners to control soil erosion — Iowa, Ohio and Pennsylvania. Based on experiences in these states, the USDA would provide model legislation for other states.

State Leadership

This strategy means the major soil and water conservation responsibility would shift to the states.

The state would:

- Develop state soil and water conservation programs for USDA approval.
- Provide technical assistance to land users.
- Fund activities that benefit state and local conservation efforts but don't contribute much to national objectives.

The federal role would be to:

- Make sure that national conservation priorities are addressed.

- Establish national standards for states and let states choose to follow them or not.
- Provide financial help to states that keep in line with national conservation objectives.

The transition of leadership from federal to state would occur in accordance with each state's desires and readiness.

Natural Resource Contracts

In a sense, this means the public would pay for a farmer's conservation practices. This would be done through contracts between the farmer and the government.

A farmer who reduces soil erosion, for instance, would be paid for each ton of soil he prevents from eroding.

Before a person entered such a contract, his land would be inventoried. If significant soil erosion, water loss and other resource problems are discovered, the owner could enter a contract and would be paid according to how well he solved these problems.

Under the present system, the commodity market pays farmers for producing crops and livestock, but offers no rewards for conserving the soil and water resources that make these products possible. Contracts with farmers would help fill this gap.

Redirect Existing Programs

Presently, soil conservation is carried out on a local and state level and the USDA provides assistance. Under this option, the USDA would redirect funds and personnel to put more emphasis on national conservation objectives.

The USDA would not create new programs. It would continue its 34 existing programs and would stress coordination and evaluation of programs.

This option may mean more conservation funds would be channeled to areas with the most serious resource problems. But the USDA would not provide funds for production practices that only indirectly control soil erosion. Also, it wouldn't assist with soil erosion control in areas with little soil loss.

Comments

Though the information presented by the USDA is the best developed to date, more information is needed. For instance, what would each strategy cost?

Of the seven proposed strategies, two are new — the cross-compliance and bonus strategies. But these two strategies could be costly because the USDA must set up a system that certifies whether a landowner is controlling soil erosion before it can make payments or loans.

Also, is the agriculture community and USDA ready for a cross-compliance program? Would cross-compli-

ance apply to all USDA programs, including disaster payments? What would it cost to administer? What would be the additional cost to the farmer?

Four other strategies - state leadership, regional resource projects, resource contracts and regulations - already have been used in some parts of the country.

Soil conservation programs have always used state leadership, though some states are now in a position to increase their efforts. Regional resource projects - including PL 506 Small Watershed Programs, Resource Conservation and Development projects and special Agriculture Conservation Program projects - have all been used in Illinois for about 15 years. Should more resources be directed to these programs?

Natural resource contracts have been used for years in the Great Plains region and long-term agreements have been used in Illinois for over five years. Under these programs, landowners can implement conservation measures with government assistance spread over a three to 10 year period. But resource contracts won't meet water quality objectives unless a majority of farmers in a particular area are willing to participate.

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Iowa adopted a regulatory program over five years ago, giving the state authority to step in when a landowner is creating a soil erosion problem. If a mandatory program was introduced in each state, the strategy would have to be carefully handled so small and medium sized farmers are not nudged out of business.

The seventh strategy, improving coordination among the existing 34 USDA programs, requires the least changes. But is it enough to get the job done?

The public also is asked to answer a collection of questions. For instance, are the USDA's objectives and strategies sound? Is USDA overlooking any approaches?

If you have comments, send them, signed, to the Resource Analysis Center, P.O. Box 888, Athens, GA 30603. Send them before March 28, 1980.

Robert D. Walker

Robert D. Walker
Extension specialist
Natural Resources

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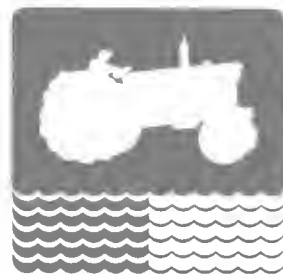
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"208" Update for Agriculture

AGRICULTURAL ISSUES RELATING TO STATEWIDE WATER QUALITY PLANNING



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Department of Agriculture Adopts Erosion Guidelines

The Illinois Department of Agriculture adopted in April the final guidelines for the state's sediment and erosion control program.

"The clock has been set in motion," says Jim Frank, head of the department's Division of Natural Resources. Each of the 98 soil and water conservation districts in Illinois now has two years to set comparable soil-saving standards.

According to Al Meyers, soil and water conservation adviser for the Department of Agriculture, district standards must be at least as stringent as state guidelines.

The long-range goal of the guidelines is for soil erosion on all Illinois farmland to be reduced to 2 to 5 tons per acre per year. This is the soil loss tolerance level, also known as the T value. At this level, nature generally can replenish soil as fast as it is lost.

The guidelines are:

- By January 1, 1983, soil loss on all farmland must be reduced to 8-20 tons of soil per acre per year (4T), depending on the soil type.
- By January 1, 1988, soil loss must be reduced to 4-10 tons per acre per year (2T). But for land where conservation tillage works and the slope is less than five percent, soil loss must be reduced to 2-5 tons per acre per year.
- By January 1, 1994, soil loss on all farmland must be less than 3-7.5 tons per acre per year (1½T).
- By January 1, 2000, soil loss must be reduced to less than 2-5 tons per acre per year (1T).

The standards will be enforced on a complaint basis, Meyers says. If someone complains that a landowner is violating erosion regulations, the local soil and water conservation district (SWCD) will try to work with the landowner and set a schedule for him to meet the standards.

If the landowner won't cooperate within a year, the SWCD must hold a formal hearing. If that doesn't solve the problem, the case will be turned over to the Department of Agriculture, which also will hold a hearing.

If the landowner still won't cooperate, the results of the public hearing must be released to local newspapers. And if the erosion problem is shown to be seriously damaging water quality, the Pollution Control Board may step in.

The key to the soil erosion program's success will be cost-sharing, Meyers says. The Department of Agriculture is confident that by 1981 a cost-share program will be available to farmers who want to use conservation tillage, he says.

Payments would be made on a per acre basis, with payments for zero tillage higher than those for conservation tillage. But Meyers says the program probably won't be available to all SWCD's the first year.

The goal is to encourage farmers not using conservation tillage to use the system — not to pay farmers already using conservation tillage.

The Department of Agriculture also hopes to eventually institute cost-share programs for other conservation strategies: terraces, diversions, vegetative covers, erosion and water control structures, sod waterways, and stream and lake protection against livestock.

If a cost-sharing program is approved, participating farmers may receive payments covering up to 75 percent of the conservation costs.

Livestock Wastes Many Farmers Still Need Waste Runoff Controls

Pencils and papers ready, here's your quiz: What pollution control regulations were farmers supposed to meet by June 30, 1979?

If your answer is the Illinois livestock waste regulations, you're right. If that isn't your answer, it may be time for a review session.

Illinois livestock regulations basically say that on all open feedlots, surface water runoff must be controlled so it will not cause water pollution.

Some producers may not have to modify their operation to meet this standard, says Art Muchling, University of Illinois Extension farm structures specialist. But

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In Illinois, more than one-fourth of the feedlots still need runoff controls.

many still need a waste-management system to keep runoff from draining into natural waterways.

Of the 58,000 feedlots in Illinois, an estimated 4,600 beef, 1,300 dairy and 10,200 swine feedlots still need runoff controls, says Robert Walker, University of Illinois Extension natural resources specialist.

Muehling points out that many feedlots were constructed when society wasn't as concerned with pollution. Feedlots actually were designed so runoff would drain into natural waterways.

This has come back to haunt farmers who must keep wastes out of streams.

Several management systems can handle feedlot wastes, Muehling says. But the main components to the basic system are clean water diversions, a settling basin, a holding pond and pumping equipment.

To keep outside water from washing onto the feedlot, construct clean water diversions around the feedlot, he says. As an added measure, install gutters on livestock buildings to divert clean roof water.

But these tactics still don't take care of runoff water coming directly from the feedlot, Muehling says. The runoff water should be directed to a settling basin.

The settling basin slows the velocity of runoff water and captures settling solids. To be sure the basin is large enough, Muehling says to allow 15 cubic feet of storage volume for every 100 square feet of the feedlot.

"This is an important step," he says, "since the basin prevents solids from accumulating in the holding ponds, helps minimize odors from the pond and makes the liquid much easier to pump through small irrigation equipment. This settled material should be cleaned out and hauled to the field after each storm."

Runoff water then moves from the settling basin to the holding pond, where it is stored temporarily. Livestock waste regulations say the pond must be large enough to store runoff from average precipitation during the period from November through April. In other words, the pond must be able to hold 12 inches of runoff from an earthen feedlot and 15 inches from a paved lot.

According to regulations, holding ponds and lagoons must be kept at a level to hold runoff following 24 hours of rainfall from the size storm that is expected once every 25 years, on the average. This means the holding pond and lagoon must be pumped down periodically to keep it at this level.

Lagoons, tanks and holding ponds must be constructed so substantial leakage cannot occur, Muehling adds.

The livestock waste regulations also list additional requirements for new feedlot facilities.

- The feedlot cannot have a stream or other body of surface water within its boundary, except for small, temporary accumulations after a rainfall.
- New facilities cannot be located so close to populated areas that it causes odor or air pollution problems. Producers also should keep in mind what adjacent land might be developed in the future.
- If the new facility is to be located on a floodplain, it must be protected against the size of flood that is expected no more than once every 10 years.
- New facilities should not be located on land that poses groundwater pollution hazards — sand, gravel or soil with fractured bedrock close to the surface.

Failure To Communicate...

Most Illinois farmers are still not sure what they must do to comply with state livestock waste regulations, according to authorities with the Illinois Environmental Protection Agency (IEPA).

Consequently, many farmers still haven't met the regulations that forbid water pollution from agricultural sources, says Eric Ackerman, one of five IEPA officials assigned to help farmers comply. The deadline to meet these regulations was June 30, 1979.

But once the IEPA contacts farmers and explains the problem, farmers generally have been willing to comply, says Ackerman.

Ross Manning, another IEPA surveillance official, agrees. In fact, he says it's "the farmers' good attitude" that keeps him going. "Most want to know how to comply."

Manning cites the case of a Scott County farmer with a hog operation. Neighbors downstream complained that swine waste was polluting the water. After investigating, Manning suggested that the farmer relocate some of the livestock lots, fence off the creek area and maintain a vegetative filter between the feedlot and waterway.

The last time he checked, Manning says, the farmer had completed plans to plant alfalfa as a vegetative strip, fence off the area and rearrange the operation so feedlots near the stream wouldn't be needed.

But even though "most" farmers will comply when asked, that doesn't mean "everybody."

Ackerman says he encountered a farmer who was unwilling to do anything about a lagoon that was overflowing and sending waste runoff to a nearby stream. In cases such as these — when the farmer will not comply — the IEPA may take the case before the Pollution Control Board. The result can be a fine.

A. G. Taylor, IEPA agriculture adviser, says that when the five surveillance officers started work last year, the plan was for them to make spot-checks to see what livestock operations were in violation. But the IEPA officials haven't been able to do much of that because their time has been used investigating complaints.

Ackerman and Manning say complaints fall into two categories — water pollution and odor.

Booklets Describe Waste Regulations

For more information on livestock waste management regulations, refer to chapter five of the Illinois Environmental Protection Act or the IEPA's booklet, *Design Criteria For Field Application of Livestock Waste*.

Obtain copies of both documents at your local Cooperative Extension office or by writing: Environmental Protection Agency, 2200 Churchill Road, Springfield, IL 62706.

The most common water pollution complaints concern farmers who let lagoons overflow, who empty liquid manure tanks into creeks or who empty manure pits into streams, Manning says.

Most of these complaints do not come from urban dwellers downstream, Ackerman adds. They come from neighboring farmers who have complaints ranging from "The stream smells like swine manure" to "My cattle won't drink the water."

Because of the large number of complaints, odor grievances get low priority unless many people are affected, Ackerman and Manning say. But odor complaints sometimes lead them to water pollution problems. Manning points out that "We are finding some correlation between poor management and odor complaints."

The waste runoff problem "boils down to management," Ackerman says. "Some farmers just give waste-management low priority."

So again, the key is education. As Manning puts it, "In general, my impression is that the educational program to make farmers aware of livestock waste-management is five years behind the times."

Ag-Related Fish Kills Increase In 1979

In 1979, most of the fish kills in Illinois were caused by agricultural pollution, reports the Illinois Department of Conservation (DOC). A fish kill is an incident when a significant number of fish are killed.

In fact, the DOC reports that the eight fish kills from agricultural pollution in 1979 were the highest number of farm-related kills ever. Industry accounted for five fish kills and municipalities for two. Two more fish kills stemmed from other causes and nine from unknown sources.

In all, there were 26 fish kills in Illinois, the second highest number ever recorded since the DOC began keeping tabs on this statistic in 1962.

The total number of fish killed by pollution in 1979 was 654,230 and their value was estimated at \$64,712. The biggest kill occurred at Horseshoe Lake in Madison County, which lost 311,707 fish valued at \$17,480.

Other major kills were reported at Senachwine Creek in Marshall and Peoria counties; Riley and Kickapoo creeks in Coles County; Saline River in Gallatin County; and Mauviss Terre Creek in Morgan County.

Fish kill surveys are undertaken by the DOC's 17 district fishery biologists throughout the state, working with personnel from the Illinois Environmental Protection Agency (IEPA).

Once notified of a major fish kill, specialists establish survey stations at strategic locations along the affected stream and they tabulate and identify carcasses. The cause of the fish kill is then traced through chemical detective work.

Agricultural causes of fish kills run the gamut from

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livestock waste runoff to fertilizer spills, says Ken Baumann, Champaign regional manager for the EPA's Division of Water Pollution Control. And large farm operations are not always the ones involved.

He cites the case of a boy who thought he was playing with an empty pesticide container. Evidently, the can was not completely empty. The boy swished the container through the stream and the result was a fish kill that spread over a mile downstream.

If the EPA "can prove beyond a doubt" who caused the fish kill, Baumann says, that person or industry may be required to pay for the cost of the fish killed. The Pollution Control Board also can levy additional fines and require that measures be taken so a fish kill doesn't happen again.

Illinois To Develop State Water Plan

When it comes to dealing with water problems, an alphabet of organizations is involved—DOC, EPA, DCE, IDA and so on.

Each of these organizations deals in some way with water problems, but oftentimes, the objectives of their water programs conflict. In an effort to coordinate various projects, Illinois is developing a state water plan.

One example of conflicting programs is the issue of water quality and power plants, says Chuck Flowe, chief of planning and research with the state Division of Water Resources.

He says the objectives of the Illinois Environmental Protection Agency (IEPA) and the Division of Water Resources sometimes clash on the question of quantity versus quality when it comes to power plants.

The IEPA forbids power plants from returning water to a stream after the water has been heated. Plants must construct cooling towers or ponds where heated water evaporates.

Flowe says this method of taking away stream water, but not returning water to the stream, conflicts with the objectives of Division of Water Resources' programs that attempt to maintain the water supply. He says it even conflicts with IEPA programs that deal with water supply.

But the coordination of programs is only one of three major goals of the water plan. The plan also will try to pinpoint the most severe water problems and identify emerging problems. As the energy crisis becomes more severe, one emerging problem might be the conversion of coal into fuel and its impact on water, Flowe says.

The water plan will differ from the 208 Water Quality Management Plan because it will deal with all water-related issues, not just water quality, he continues. It also will differ from a 1967 water plan. The '67 plan was a good inventory of water problems and it proposed a number of projects, Flowe says, but it didn't tackle the interrelationships among present programs.

Representatives of 15 agencies will make up the task force working on the plan, Flowe says they hope to develop a plan of study by December 31, 1980. But it's in the early stages, he adds, so the timeline may change.

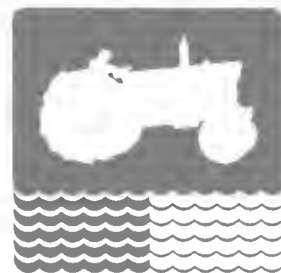
Robert D. Walker
Extension specialist
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"208" Update for Agriculture

AGRICULTURAL ISSUES RELATING TO STATEWIDE WATER QUALITY PLANNING



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Fall, 1980



The chisel plow, a conservation tool to combat erosion, is replacing the moldboard plow on land where soil erosion is a problem.

State Cost-Share Plan Receives Approval

Illinois now has a state-funded conservation tillage cost-share program for 1980-81.

The General Assembly and Gov. Jim Thompson recently approved a \$500,000 cost-share plan that will be administered by the Illinois Department of Agriculture's Division of Natural Resources (DNR), in conjunction with local Soil and Water Conservation Districts (SWCDs).

Eligible farmers will be able to set up cost-share schedules that cover from one to three years, says Steven Morgan, DNR staff member. Payments will be

made on a per acre basis, with higher payments for those using zero tillage than those using a reduced tillage system (chisel or disk planting).

Not all of the 98 SWCDs in the state will be able to participate the first year, Morgan says. The DNR will give priority to SWCDs in areas with the most severe soil erosion problems. Those chosen will be allotted a budget for cost-sharing.

In turn, each SWCD that receives money for cost-sharing will evaluate which farmers applying for the program should get highest priority. The DNR has provided each district with suggested rates for cost-share payments (see the table on page 2). The SWCD can vary the payments per acre but cannot change the

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Suggested Cost-Share Rates

		Zero-Tillage System	
Year of Contract		Into Corn Residue	Into Bean Residue
1st		\$25	\$20
2nd		\$18	\$13
3rd		\$10	\$ 7

		Reduced Tillage System — Corn Residue			
Year of Contract		1500 lbs. (45 %) ¹	2500 lbs. (63 %)	3500 lbs. (77 %)	4500 lbs. (85 %)
1st		\$10	\$15	\$20	\$25
2nd		\$ 7	\$10	\$14	\$18
3rd		\$ 3	\$ 5	\$ 7	\$10

		Reduced Tillage System — Bean Residue			
Year of Contract		750 lbs. (43 %)	1250 lbs. (56 %)	1750 lbs. (66 %)	2250 lbs. (74 %)
1st		\$10	\$15	\$18	\$20
2nd		\$ 7	\$10	\$12	\$13
3rd		\$ 3	\$ 5	\$ 6	\$ 7

¹ Percent figures indicate the amount of surface covered at planting time. Percent of surface covered will be calculated to determine if residue levels have been met.

requirements for pounds of residue per acre.

Farmers who have previously used reduced tillage successfully are not eligible for the reduced tillage cost-share program. And farmers who have previously used no-till successfully are not eligible for the no-till program. The total acreage under any contract cannot exceed 50 acres per year and eligible crops are corn and beans, Morgan continues. Also, a farmer with a multiple year contract must use conservation tillage on the same 50 acres each year.

Morgan says the period for entering cost-share contracts will be Sept. 8 to Oct. 3, 1980.

If, for some reason, a farmer cannot get a cost-share contract, he may sign a stand-by contract. Under this contract, a farmer would not be guaranteed payment for using conservation tillage. But he may receive payment

if a regular contractor fails to meet his contract, drops out of the program or qualifies for a lower payment.

Morgan stresses that SWCD directors will be careful that the state's cost-share plan does not bump heads with the cost-share plan offered by the Agriculture Stabilization and Conservation Service (ASCS). The ASCS program is run with federal funds.

Any farmer using conservation tillage as part of the ASCS program is ineligible for the DNR's program.

If a farmer is suffering hardship, such as severe insect problems on no-till land, Morgan says the SWCD will determine whether to relieve that person of his obligation that year.

But even if a farmer is released from one year of the contract, he must still eventually fulfill all of the years.

Agencies Get Strict On Channel Modification

State and federal agencies are taking a harder line on channel modification.

Channel modification projects involve anything from transforming a meandering stream into a straight waterway to removing obstructions in streams or re-routing a waterway. And it is a practice that has received its share of controversy.

Channel modification has a variety of purposes. For example, the Department of Transportation may re-route a stream to prevent a bridge or road from being undermined.

Farmers sometimes straighten channels in order to increase the speed of water flow so their land will drain faster and flooding problems will be reduced. But although straightening a channel may solve one farmer's flooding problems, it can cause additional problems for the neighbor downstream, says Bruce Klein, senior field biologist with the Fish and Wildlife Service. Then this neighbor wants to straighten his portion of the stream

and the domino-like process gets underway.

According to Steve VanderHorn, chief of enforcement and inspection with the U.S. Army Corps of Engineers-Rock Island District, until recent years most people who wanted to modify a water channel faced few restrictions. But that has changed.

Section 404 of the Clean Water Act required that after July 1, 1977, if a person wants to create a new channel, he needs a permit from the U.S. Army Corps of Engineers before the old channel can be filled. Landowners also must have a permit from the state Department of Transportation, Division of Water Resources, before a new channel can be created.

Dennis Kennedy, head of the technical analysis and permit unit of the Division of Water Resources, says his office issues permits under the authority of the Rivers, Lakes and Streams Act of 1911.

But he says the Division is in the process of drafting rules on all permits regarding work on rivers, lakes and streams, including permits for channel modification. And he says the rules will reflect the Division's decision

Erosion Goals Realistic, But...

Reducing soil erosion has obvious environmental benefits. But in order for soil-saving strategies to work, many people need the added motivation of economic benefits. So an important question is, "Are the goals to reduce soil erosion in Illinois realistic from a long-term economic perspective?"

Earl Swanson, University of Illinois agriculture economist, concludes that, "Yes, they are reasonably accurate."

The Illinois Department of Agriculture's major goal is to reduce soil erosion on all farmland to the soil loss tolerance level, also known as the "T level," by the year 2000. At this level, nature can replenish soil as fast as it is lost by erosion. Depending on soil type, the soil loss tolerance level generally is 3 to 5 tons of soil loss per acre annually.

Swanson and graduate student Klaus Froberg conducted a study which concluded that those who follow the "societal view" of economics, should find it economically realistic to meet state erosion goals.

Swanson notes there are two basic economic philosophies: the societal view and the private view. The private view only considers the economic impact on the individual farmer and landowner while the societal view considers the economic impact on society as a whole. For instance, someone subscribing to the private view would not consider the economic damage of erosion downstream, but someone holding a societal view would.

But there is a hitch. Even though the study generally showed that state soil erosion goals are economically realistic for farmers who hold a societal view of economics, Swanson points out that in reality most people maintain a private view of economics.

So Swanson says the study shows the need for either more economic incentives or the development of a conservation ethic in which farmers consider the effect of erosion on society as a whole.

Swanson and Froberg's study, which was made on the Big Blue watershed in northeastern Pike County, looked at the economic consequences for a 50-year period. The study took into consideration a collection of factors including the slope of the land, sediment damage off the farm, the export demand for various crops, and the importance that farmers give to conserving soil for future generations. By plugging these and other variables into a computer, they came up with soil erosion goals that were economically realistic.

In all, they looked at six scenarios and generally, Swanson says most of the figures they came up with fell in line with state goals. There were a few cases in which the economically realistic goals were different than state goals.

But again, because most farmers maintain a private view of economics, he says either stronger soil-saving incentives must be given; or else farmers will have to change their attitudes.

William Oschwald, Cooperative Extension Service Director, echoes Swanson's views. He calls for a conservation ethic that is sensitive to the "interrelationships of natural resources with the productive capacity of the food/fiber system."

Oschwald also describes some of the attitude changes that would be necessary for a conservation ethic to develop:

"It may require recognition that erosion control, as well as profit, is a goal of a crop production system," he says. "It may require a willingness to modify pest control strategies to fit erosion control goals, rather than just modifying crop production systems, including tillage, to provide pest controls."

Vegetative Filters: Low-Cost Waste Control

Vegetative filters may be a low-cost answer to the feedlot runoff problem, says Art Muehling, University of Illinois Extension agricultural engineer.

Although pollution-control agencies haven't given blanket approval to vegetative filters, U of I research so far has shown that they "can provide a satisfactory, low-cost means of controlling feedlot runoff for many small and medium-size livestock facilities."

In a typical feedlot waste-management system, runoff flows into a settling basin and then to a holding pond, from which it is spread on nearby land.

But Muehling says the cost of this system can be more than farmers are willing to spend, particularly those with small feedlots. Also, this system requires more management than a vegetative filter system; the settling basin must be cleaned regularly and the holding pond must be pumped out.

A vegetative filter is a pasture, grass waterway or terrace channel located next to the feedlot. Although a settling basin is used in this system, the filter replaces the holding pond and absorbs runoff pollutants. Runoff is directed either evenly across the sloped area or channeled through a winding grass waterway.

"Many existing small feedlots already have some form of vegetative filter," Muehling says. "And in many others, a filter could be added with little cost and effort."

But the filter won't work for every situation, he adds. If the feedlot is too big, the land too steep or the feedlot too close to a stream, the filter may not be able to capture pollutants before they wash into waterways.

Spring poses another problem, Muehling says. If the ground is frozen and rain is heavy, a vegetative filter may not be able to absorb much of the pollutants.

U of I studies on four vegetative filters have shown that the filters remove enough pollutants to meet Illinois water quality standards, unless rainfall is unusually heavy.

the assessment include both local and downstream areas, as well as upstream areas."

Present erosion control efforts concentrate on safeguarding soil productivity, often forgetting other environmental factors, Karr says. For example, the major goal is to reduce erosion to the "T level," the level at which erosion doesn't damage soil productivity. But he points out that though soil productivity may be safe when erosion is at the T level, in some cases this level of erosion may still damage water quality.

So meeting the T level may not always be enough to maintain biological integrity, Karr says.

Karr and Daniel Dudley of the Ohio Environmental Protection Agency co-authored a paper that proposes ways to help preserve the biological integrity of waterways.

They suggested a "classified stream" system, which involves the well established principle of setting aside natural areas for protection. A classified stream would receive particular protection such as buffer strips. Backing up the program would be financial rewards for landowners who cooperate with the classified stream system.

As an example of the intricate relationship in an environmental system, Karr described some findings from his work on Black Creek in Indiana.

Among other things, the study examined the effects of removing vegetation along a stream. Normally, when there is vegetation along the stream, in autumn leaves fall into the water. The leaves provide organic material, an energy source for certain insects and other aquatic

organisms. When the vegetation disappears, insects lose their food supply and their numbers dwindle; in turn, so do many species of fish that feed on the insects.

Problems then move downstream. Organisms upstream normally process the leaves into Fine Particulate Organic Matter (FPOM) which is essential food downstream. When leaves disappear, this food supply is lost.

Also, without vegetation acting as a filter, more nutrients from farmland reach streams. And less vegetation means less shading. Combine the additional light with additional nutrients and Karr says, "you have an ideal environment for algal blooms. Streams become a choking mass of low quality algae."

"Small streams play a major role in nurturing fish populations for larger rivers nearby," Karr adds. Small streams are more predator-free and vegetation provides cover for young fish. "In the absence of cover, fish lose spawning grounds," he says.

Karr would like agriculture to be the leader in the move for biological integrity. "It's in their interest," he says. "If agriculture doesn't act voluntarily, it risks having bureaucrats telling them what to do."

Also, society has a tendency to pick a scapegoat, he says. If water resources continue to deteriorate, society may choose agriculture as the culprit.

"If agriculture takes a leading role in water quality, it can come off looking like the fair-haired boy," Karr says. "But this will require an expanded perspective and technical expertise, including cooperative efforts with other segments of the public and private sectors."



Without vegetation on the bank or a buffer strip between the bank and cropland, this stream is highly susceptible to sedimentation. A buffer would protect the bank from gully erosion and would filter out soil and nutrients coming from the farmland.

to "take a harder line than in the past, recognizing the adverse effects of channel modification."

The "adverse effects" are many, Klein says. For instance, by straightening a channel, water flow is increased and more sediment is transported downstream.

Channel modification destroys the natural habitat for wildlife and the spawning ground for fish as well as disrupts the food chain, he continues. Vegetation along the stream often is removed during modification, and, since vegetation acts as a filter for runoff from land, more soil and chemicals from nearby farmland can reach the water.

But even though stricter regulations are in the offing, Klein, VanderHorn and Kennedy agree that many landowners still modify streams without going through the permit process. And the most common people to make such modifications are farmers, they say.

Klein says illegal channel modification practices in Illinois are reported to the Fish and Wildlife Service almost every day.

The criminal penalty for filling an old channel without a permit is a fine of not less than \$2,500 and not more than \$25,000 per day of violation, VanderHorn says. The landowner also faces imprisonment of not more than one year. The civil penalty is a fine of up to \$10,000.

But VanderHorn says the enforcement process is so expensive and lengthy that usually his office tries to work out a resolution with the violating landowner. If the landowner's channel modifications would have been approved through the normal permit process, then the Corps of Engineers may issue an after-the-fact permit. If the modifications would not have been approved, the landowner may have to restore the channel to its original condition — an expensive requirement.

Though many landowners modify channels without permits, VanderHorn says most are not out "to spite the law. It's out of ignorance." He says most people are not aware of regulations governing channel modification.

In fact, VanderHorn says the Rock Island District of the Corps of Engineers is considering making a mass mailing to farmers and developers to explain the requirements for filling channels.

The use of channel modification also has been a point of contention between the Soil Conservation Service (SCS) and the Fish and Wildlife Service, but that too is changing.

Throughout the years, the Fish and Wildlife Service opposed any channel modification, while the SCS made use of modification practices. Today, the SCS does little modification, Klein says, and the modification that goes on is regulated by an agreement between the SCS and Fish and Wildlife Service.

Mike Schendel of the state SCS office in Champaign says the basic thread running through the guidelines is the idea that channel modification is only to be used as a last resort. The guidelines point out the biological im-

portance of keeping streams in a natural state. But they also say that, used in a sensitive manner, modification might still be justified in some cases — to repair a damaged water course or to help maintain agriculture productivity.

The guidelines go on to detail the process of evaluating whether channel modification is justified, again stressing that modification should only be made as a last resort.

Schendel says that in the past, the SCS, as well as other state and federal agencies, in some cases used channel modification "without fully considering environmental concerns." But, he says, the guidelines have solved that problem and have opened "a good relationship between what once were opposing parties."

The SCS and Fish and Wildlife Service are now in the process of transforming the guidelines into rules for their field staff.

Erosion Control Programs And 'Biological Integrity'

The Water Quality Act Amendments of 1972 called for the restoration and maintenance of "the chemical, physical and biological integrity of the nation's waters."

According to Jim Karr, University of Illinois professor of ecology, efforts to improve water quality using traditional soil erosion programs do not fully meet this mandate. Maintaining "biological integrity" requires more than just clean water and productive soil, he says.

"If Congress just wanted clean water, we could create concrete ditches and fill them with distilled water," Karr says. "Congress had in mind a water resource that is a great deal more."

Traditional soil and water conservation programs have mainly focused on soil resources, drainage, production and, to a lesser extent, water quality, Karr continues. He said he would like soil and water conservation organizations to expand their role and set up programs that also will consider the management of habitat characteristics, flow regime (the flow and level of water) and energy sources such as food chains.

In other words, instead of dealing with environmental issues in bits and parcels, the entire biological system should be considered, he says. To reflect this attitude, he would like to see the list of best management practices (BMPs) for soil erosion be expanded when water quality is a primary goal.

In such cases, he suggests that BMPs for erosion control be integrated with BMPs for water quality improvement; the result would be best management systems that improve both soil and water resources.

According to Karr, "The following questions must be routinely asked: What will be the effect of the juxtaposition of several (best management) practices? How will they affect the widest range of water resource characteristics? Don't just ask how they will affect erosion control on land or water quality. . . . It is important that

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Notes

Water Plan Forums Set

The State Water Plan will be the topic of five public forums to be held throughout the state in September and October.

The purpose of the forums is to gather public comment on the 1981 proposed plan of work by the State Water Plan's Task Force.

The forums will be held in the following locations:

- Chicago, Sept. 12 at 1 p.m. in the Beverly Room of the Conrad Hilton Hotel. It will be part of the Illinois Municipal League's annual meeting.
- Peoria, Sept. 16, at 7:30 p.m. in the auditorium of the University of Illinois-Peoria School of Medicine.
- DeKalb, Sept. 23, at 7:30 p.m. in the Capitol room of the Holmes Student Center at Northern Illinois University.
- Carbondale, Sept. 30, at 7 p.m. in Ballroom B of the Southern Illinois University Student Center.
- Edwardsville, Oct. 1, at 7 p.m. in the St. Clair Room of the SIU University Center.

All interested persons are urged to attend and written comments also are welcome. More information is available from The Water Resources Center, 2535 Hydrosystems Laboratory, University of Illinois, Urbana, IL 61801. The telephone number is 217-333-0530.

Illinois River and Canaries

Frank Bellrose, wildlife specialist with the Illinois Natural History Survey, likens the Illinois River Valley to canaries that miners once used to signal when gas was reaching a dangerous level.

When the canary died, workers knew it was time to get out of the mine. In the same way, Bellrose says sedimentation problems in the Illinois River Valley signal similar troubles with other waterways in the state.

Bottomland lakes along the Illinois River are filling with soil so fast that Bellrose says, "Many of the lakes have a short life left."

It would have taken thousands of years for these lakes to fill naturally with sediment, he says, but humans may do that job within the next generation.

Soil-Saving Survey

University of Illinois agriculture economists Wesley Seitz and Earl Swanson recently took a survey which found that most farmers believe soil erosion controls are needed; but only 5 percent said they were doing an "excellent job" of applying conservation practices.

Seventy-six percent of the farmers surveyed said soil erosion control was necessary to maintain soil productivity and 70 percent said it was necessary to accomplish water quality goals.

Though only 5 percent said they were doing an excellent job with conservation, 35 percent said they were doing the best they could under the circumstances. Twenty-five percent said they were doing an adequate job, 10 percent said they were doing an average job and 25 percent said they could do better.

Robert D. Walker

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Extension specialist
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AGRICULTURAL ISSUES RELATING TO STATEWIDE WATER QUALITY PLANNING



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Erosion Cited As Worst Water Problem

Erosion has been pegged as the most critical water-related issue in Illinois, according to participants at five regional forums dealing with revisions of the State Water Plan.

Participants at the forums—which were held in September in Chicago, Peoria, DeKalb, Carbondale and Edwardsville—were asked to prioritize five out of 18 water-related issues presented by the Water Plan Task Force.

Issues were ranked in this order:

1. Erosion and sediment control. 2. Integration of water quality and quantity. 3. Water conservation. 4. Floodplain management. 5. Illinois water use law. 6. Energy. 7. Irrigation. 8. Meaningful public participation in water resource planning. 9. Urban competition for water.

Also, 10. Mechanisms to resolve water conflicts. 11. Drought. 12. Aquatic and riparian habitat degradation. 13. Recreational use. 14. Regional competition for water. 15. Navigation. 16. Instream flow needs. 17. Atmospheric deposition (for example, acid rain) and climatic change. 18. Planned weather modification.

Glenn Stout, director of the Water Resources Center in Champaign, says that attendance at all of the forums, except the one held in Chicago, exceeded the Task Force's expectations. In all, 310 people attended. Based on forum feedback, he says the Task Force decided to reorganize its water resource "shopping list" into 12 topics.

But Stout notes that many people confuse the State Water Plan with other programs. So to avoid confusion, remember the following equation—the Illinois State Water Plan does not equal the Illinois State Water Quality Management Plan.

The Water Quality Management Plan focuses on nonpoint sources of pollution while the revised State Water Plan will attempt to coordinate various governmental agencies involved in water resource management, he says.

Another difference is that the State Water Plan is



The raindrop splash begins the erosion process.

still in the midst of revisions while the Water Quality Management Plan is off and running.

Illinois consumes 46 billion gallons of water every day. And this sizeable resource, managed by a sizeable number of government agencies, is in need of coordination, Stout says. This "coordination" aspect was lacking in the original 1967 State Water Plan. Stout says the 1967 plan was mainly an inventory of water resources, though it also proposed some water management programs.

In the past, water management agencies often have acted more or less independently, he continues. But not only do some of the agencies' programs overlap, some

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conflict, he says. Another goal of the revised State Water Plan will be to establish methods of resolving these conflicts.

Also, the newly revised plan does not intend to create another bureaucratic layer on top of existing programs. It aims to help agencies locate gaps — problem areas that have not been adequately dealt with.

Because the existing State Water Quality Management Plan deals with nonpoint sources of pollution such as erosion, the erosion issue would probably be an example of an area that is being adequately dealt with, Stout says.

On the other hand, a study of certain areas, such as floodplain management, may reveal definite gaps, according to the Task Force. Its report points out the inadequate surveillance and enforcement of floodplain construction, as well as damages caused by federally-funded encroachment.

Construction on a floodplain hampers the plain's function as a storage spot for flood waters.

In other areas, the Task Force may discover a poverty of solid research. For example, the Task Force indicates that weather modification is an issue "frought with scientific uncertainties."

The State Water Plan also will try to prepare for emerging issues, such as water quality and the search for new energy sources. As the United States scrambles for energy independence, new energy sources may mean a need for more water.

Energy and water raises a number of issues in Illinois — the effect of coal mining on water supply, the economics and environmental conflicts of coal transportation, the potential for lowhead hydropower and the development of synthetic fuels and its impact on water quality.

The Task Force's goal is to complete preliminary reports on the major water resource issues by December 1981, Stout says. "It's supposed to be a dynamic plan," he points out. "This means the plan will evolve and change as time progresses."

Irrigation Potential Raises Question About Water Supply

The use of irrigation in Illinois is increasing and farmers throughout the state may turn to this thirst-quenching system for crops at an even faster rate because of the 1980 drought, says Marlowe Thorne, University of Illinois Extension agronomist.

If the number of irrigated acres continues to increase, the question arises: How much strain would it put on Illinois water resources?

A study by J. Wayland Eheart and Angela E. Libby of the U of I civil engineering department concludes that irrigation deserves a "watch out" attitude, as Eheart puts it.

"I'm not saying that irrigation is definitely going to

increase to the point that it puts a stress on water resources," Eheart says. "But it's enough of a risk that we should be prepared for any problems."

Irrigation was used on only about 140,000 acres in Illinois in 1980, but Thorne says the number of irrigated acres has increased about 15 percent per year during the past decade.

Thorne agrees that "caution is worthwhile, but some people think that Illinois, like western states, is in a critical situation and that our water supply shouldn't be used for irrigation. That assumption is wrong."

Presently, Illinois' water supply is more than adequate, Thorne says. An exception is in the Chicago area where some counties are using water faster than nature can replenish the supply.

The average amount of rainfall in Illinois each year is 36 inches. According to Thorne, "Twenty-six inches per year return to the atmosphere through evaporation from the land and water and through plant transpiration. This leaves an excess of 10 inches per year to accumulate in streams or pass through the surface layers of the land and become groundwater."

Another encouraging note, he adds, is that while Illinois residents withdraw 13 billion gallons of water per day for off-channel uses, the potentially available water is four times that amount.

Thorne also points out that irrigation in Illinois is not as demanding as irrigation in the West, where water resource problems are critical.

"It may be worthwhile to point out that our average annual water requirement for irrigation in Illinois is only about six inches per year," he says. "This compares with the 2 to 3 feet of irrigation water per year required in many parts of the arid West."

But Eheart still advises caution. He bases this concern on a study he made on the Little Wabash Basin in southern Illinois. He and Libby looked at the price that corn would have to reach to make irrigation profitable for farmers in that area.

As Eheart explains, before a farmer invests in irrigation, he must judge whether the increase in yields from the system can justify the irrigation expense. And the necessary increase in yields is dependent on the commodity's price.

According to the study by Eheart and Libby, if the price of corn reaches a long-term average of \$3.50 per bushel — in 1979 dollars — it would be economically sound for farmers in the Little Wabash Basin to irrigate either by direct withdrawal of water from a stream or by using water pumped from wells.

Although the actual average price of corn in Illinois in 1979 was \$2.50 per bushel — below the \$3.50 per bushel figure in the study — if the price of corn increases faster than the cost of irrigation, it may eventually become economically feasible to irrigate in the Little Wabash Basin area.

John Scott, U of I Extension agricultural economist, projects that in the next 10 to 15 years, commodity

ADAPTING To A Crisis

"In 1969, some of us boaters kept running into bars of mud in the north end of the lake," says Harry Wright, University of Illinois Extension adviser in Pike County.

This was one of several clues that the Blue Creek Watershed was suffering severe soil erosion and Lake Pittsfield was being strangled by sedimentation — soil washing into water.

A 1974 survey on Lake Pittsfield confirmed the fears. According to the survey, sediment had filled 1.24 percent of the lake each year since the lake was built in 1961. This is well above the average annual sedimentation rate for Illinois lakes — .5 to .8 percent.

In response to the problem, help has come from a battalion of state and federal agencies — the Illinois Environmental Protection Agency (IEPA), the University of Illinois Cooperative Extension Service, the Soil Conservation Service, the Agriculture Stabilization and Conservation Service and the Illinois State Water Survey, among them.

Why such attention for Blue Creek Watershed and its man-made lake?

According to a report by the IEPA, the Blue Creek "had been identified as one of the most seriously impacted areas experiencing high pollutant yield and water quality problems." The report also says that the Blue Creek sediment control program would make a good model for other water-quality problem areas in the state.

So the agencies have several goals: to help solve the Blue Creek erosion woes, to evaluate the impact of soil conservation practices on water quality and to test a new land management planning tool. The tool being tested is called the Areal Design and Planning Tool, also known as ADAPT.

To put it simply, ADAPT is a computer system designed to identify the areas with the most erosion and illustrate the effectiveness of various soil conservation practices, says Bill Sullivan, IEPA regional planning coordinator.

First, the computers are fed with a supply of information ranging from land use to various topographical features such as soil type and steepness of slope. Added to this data base are factors from the Universal Soil Loss Equation, the equation used to estimate soil loss on pieces of land.

Finally, a series of "What ifs?" are plugged into the system. The computers respond by producing statistics and maps that show the impacts of different soil-saving techniques on the Blue Creek Watershed.

Sullivan says nine "What ifs?" were examined on Blue Creek:

What if land were fall contour-plowed? What if it were plowed up and down the slope? What if conservation tillage were used, leaving either 1,500, 3,500 or 6,000 pounds of residue on the ground? What if the spacing between terraces were 90, 120 or 150 feet?

What if all land with slopes over 15 percent were converted to pasture?

The maps that the ADAPT system produced showed that of the various Blue Creek scenarios, conservation tillage was the most cost-effective best management practice (BMP) for combatting erosion, says Tom Davenport, IEPA environmental protection specialist.

Sullivan points out that the key to ADAPT is in the data base. If the data base is inaccurate, so will be the estimates on soil erosion and the effectiveness of BMP's.

"'Garbage in' is not 'gospel out,'" he says. "It's 'garbage out.'"

So the ADAPT results were compared to more intensive field-by-field studies made on the upper half of the Blue Creek Watershed. And according to Davenport, ADAPT was able to identify the worst erosion spots just as well as the more time-consuming and expensive manual studies.

He says ADAPT will now be compared with even more intensive manual studies made on the Blue Creek Watershed.

Sullivan notes that ADAPT will not be able to pinpoint the exact soil loss estimates for a particular area. But it will indicate which areas suffer the most erosion, thus helping the government and the public know where to put their priorities.

And it can do this cheaper than the manual method, Davenport says. In Livingston County — one of four other counties where ADAPT was tested — ADAPT computers were able to produce 10 scenario maps for \$14,000, while the manual method produced just one map for \$18,000. "Also, remember that with ADAPT, the data base still exists for other purposes, and with the manual method, you just have the map," Davenport says.

ADAPT is just one facet of the Blue Creek Watershed project, he continues. The IEPA also is intensively monitoring lake and stream water quality, hoping to make links between best management practices and changes in water quality.

Wright says he is encouraged by the various agencies' investment of time and money in the Blue Creek Watershed, as well as their good relationship with area citizens.

"If you're going to have a government that manages farm prices, you need a public investment to conserve soil," he says. "And we need more of it."

Notes

RCA Update

Public response to the Soil and Water Resources Conservation Act (RCA) revealed a strong interest in reducing soil erosion, but little interest in doing it through regulations, reports the United States Department of Agriculture (USDA).

From January to March, 1980, the USDA asked the

Estimating Crop Residue

Problem You want to estimate the soil erosion problem on a piece of land, using the Universal Soil Loss Equation. But to do so, you must know the estimated weight of crop residue that is left on the land (residue helps reduce erosion).

Solution: Use the "point and line" method.

Using the point and line method, you can figure out the percentage of soil surface covered with crop residue, says Robert Walker, University of Illinois Extension natural resources specialist. In turn, by knowing the percentage of surface cover, you can find out the weight of residue left on the land.

Begin with a piece of 1/8-inch or 3/16-inch nylon rope, about 70 feet long, he says. Tie one hundred knots, spacing them 6 inches apart. After tying the knots, the rope should shorten to just about 50 feet long (lines also are available commercially).

Next, make a short loop at each end of the rope and tie the ends to stakes. Then stretch the line diagonally, approximately 45 degrees across the crop rows. The angle of the rope should be adjusted so both stakes are placed within rows.

Standing over the rope and looking straight down on the knots, count the knots that intersect a piece of crop residue, Walker continues. Ignore small pieces of residue that will decay easily or that are too small to intersect a raindrop. Even though stones will intersect raindrops, do not count them.

The number of knots that intersect a piece of crop residue equals the percentage of soil surface covered

with residue, he says. For example, if 85 of 100 knots intersect a piece of residue, then your field has 85 percent residue cover.

Repeat this process on three other randomly selected areas of the field and take an average of all four counts. The critical time to estimate residue cover is immediately after planting.

Once you know the percentage of surface cover, Walker says to consult the following table to determine the weight of the residue:

Estimated Percent of Surface Cover	Corn or Sorghum Grain Residue	Small Grain or Soybean Residue Mulch
<i>Pounds per acre</i>		
32	1,000	500
55	2,000	1,000
70	3,000	1,500
82	4,000	2,000
88	5,000	2,500
93	6,000	3,000
95	7,000	3,500

Then, by plugging the figure for residue weight into the Universal Soil Loss Equation, you are a step closer to learning the estimated amount of soil erosion on your land. For more information on the soil loss equation, the booklet, "Estimating Your Soil Losses With The Universal Soil Loss Equation," is available at your county Cooperative Extension Service office or by writing: Robert Walker, 330 Mumford Hall, Urbana, IL 61801.



With the "point and line" method, the number of knots that intersect crop residue indicates the estimated percentage of residue on a piece of land.



Irrigation in Illinois: Not widespread, but increasing.

prices actually will increase faster in relation to other prices.

If irrigation eventually became an economically attractive option for farmers in the Little Wabash Basin and if enough farmers began irrigating, Eheart says such use could put a strain on water resources in that area. He says that if Little Wabash Basin farmers started sinking wells or using direct withdrawal from streams, they potentially could withdraw water from the basin at a rate of 20 cubic feet per second.

At this rate, he says, the amount of water taken from the stream would exceed the stream's flow about 25 percent of the time during the heavy-use period of May 13 through July 22. And this is a conservative estimate, Eheart adds. Presently, the rate of withdrawal exceeds the stream flow less than one percent of the time.

But there is a constellation of other factors that could influence what actually will happen in the Little Wabash Basin or any area, for that matter, he says. For example, just because irrigation is economically sound in an area doesn't mean all of the farmers will install irrigation systems.

Also, he notes that because the Little Wabash Basin is an area with little groundwater, wells would be located near the stream and would take water more or less directly from the stream. Thus, wells in an area such as the Little Wabash Basin would have more impact on a stream than wells in an area where there is ample groundwater.

Presently, irrigation in Illinois is concentrated on sandy soils that have a low moisture-holding capacity. "Because these soils typically cannot support a crop through any extended dry period, irrigation can make the difference between excellent yields and reduced yields—or even crop failure," Thorne says.

Mason County, an area covered with sandy soil, leads the state with 60,000 acres of irrigated land. But irri-

gation in Mason County has not put a strain on water resources because there is an abundant water supply from the Illinois River and the sandy soil absorbs a high percentage of rainfall.

There are 2 million acres of Illinois farmland with sandy soil, so Thorne says it is plausible that the amount of irrigated acreage eventually could reach that figure. He says irrigation also might increase on heavy clay soils, which make up much of the southern third of Illinois. The major limitation to expanded irrigation on those soils is the lack of groundwater in Southern Illinois.

According to 1975 figures, irrigation withdraws the least amount of water in Illinois compared to five other water-use categories: public supplies, nonpower industry, thermoelectric power industry, hydroelectric power and other rural uses.

And among these same categories, irrigation ranks fourth in the amount of water consumed. Water "withdrawn" refers to the amount of water used, including water that can be returned to the system, while water "consumed" is the amount of water used that cannot be returned.

"The difference between water withdrawal and consumption may be better understood by using the example of a lending library," Thorne says. "Books withdrawn would be those taken out of the library. Books consumed would be those lost or destroyed so that they never get back into the library again for further use."

Generally, irrigation consumes a greater percentage of the water it withdraws than other water uses do. For example, according to nationwide statistics, industry withdraws 58 percent of the water and irrigation withdraws 34 percent. But irrigation consumes 83 percent while industry consumes 6 percent.

This is one reason why irrigation deserves a watchful eye, although it presently poses no problem, Eheart says.



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public to respond to its proposed soil erosion objectives and erosion control strategies. After the review period, the USDA analyzed 64,872 responses signed by 118,213 people.

Respondents gave strongest support to the objectives of reducing soil erosion, maintaining soil quality, retaining prime farmland in agriculture, using organic waste and increasing energy production.

Objectives that received the least support were: reducing to zero the net loss of wetlands to agriculture, increasing instream flows and increasing irrigation efficiency. But even for these less popular objectives, those in agreement outnumbered those in disagreement by 3 to 2.

Of the seven proposed erosion control strategies, the most support was given to redirecting present conservation programs and providing bonuses for landowners using conservation systems. The least support was given to the regulatory approach.

Fertilizer And Reduced Tillage

Even though the vertical distribution of fertilizer in soils is less uniform with reduced tillage systems than with moldboard plow systems, this "does not appear to limit nutrient uptake and yields," says Robert Pope, University of Illinois Extension agronomist.

According to Pope, even when chisel plows and disks are operated at the same depth as the moldboard plow, they do not incorporate fertilizers and limestone as thoroughly as the moldboard plow. As a result, phosphorus and potassium tend to concentrate in the top two or three inches of the soil.

But a 1975 U of I study bears out Pope's point that this uneven distribution does not limit yields. For example, when phosphorus was incorporated below the surface with a chisel plow, yields equaled those when the same amount of phosphorus was incorporated with the moldboard plow.

Federal Conservation Tillage Cost-Sharing Increases

The number of Illinois farmers participating in the federal conservation tillage cost-share program has increased more than 12 times since 1976, reports the Agriculture Stabilization and Conservation Service (ASCS).

According to the ASCS, 34 counties cost-shared with 68 farmers on 2,800 acres in 1976. In 1979, 51 counties cost-shared with 402 farmers on 15,000 acres and in 1980, 63 counties cost-shared with 861 farmers on 27,229 acres.

Illinois Ranks Fourth In Reduced Tillage Acreage

According to a survey by *No-Till Farmer*, Illinois ranks fourth in the nation in both the number of acres in no-till and minimum tillage. But it also is third in the number of acres in conventional tillage.

The survey reports that in Illinois in 1980 there were an estimated 551,200 acres in no-till, 5.6 million acres in minimum tillage and 16 million in conventional tillage.

Nationwide, the number of no-till acres jumped from 6.7 to 7.3 million while minimum tilled land increased from 78.5 million to 81.4 million.

Robert D. Walker

Robert D. Walker
Extension specialist
Natural Resources

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Supply, Demand and Impermanence Could Mean Erosion Problems

The conversion of agricultural land to other uses could intensify the soil erosion problem, says the federal government's National Agricultural Lands Study.

The problem begins with supply and demand. Over the next 20 years, the U.S. Department of Agriculture projects that demand for U.S. agricultural products will increase by 60 to 85 percent over the 1980 level, assuming constant real prices.

In order to meet this demand, the Agricultural Lands

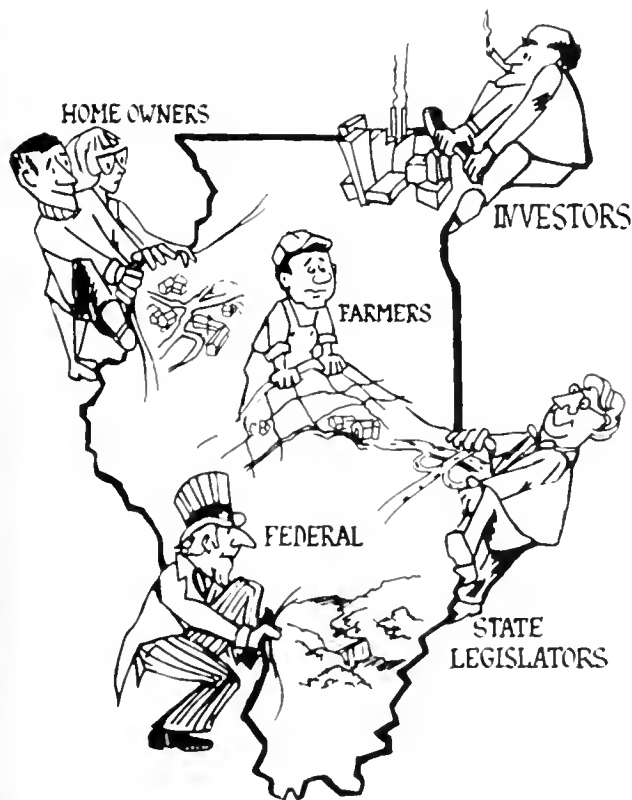
Study says that either yields will have to increase dramatically or more land will have to be brought into production.

But much of the land that will have to be brought into production probably will be "more susceptible to erosion, groundwater overdrafts and other environmental problems," the Study says. "Hence, its cultivation results in higher social costs either through conservation expenditures or through environmental degradation."

According to the Agricultural Lands Study, 3 million acres of agricultural land are converted to other uses every year and 675,000 acres of these come out of cropland. This rate of conversion may have indirect effects on the erosion problem through an "impermanence syndrome."

"Looking beyond their fences to new developments, many farmers see the opportunity to sell their farms at a large profit for nonagricultural uses," the Study explains. "Depending on the intensity and proximity of the growth, farmers in such areas often believe that agriculture is no longer permanent."

Because these farmers see agricultural use of the land as impermanent, they may be less likely to invest in conservation practices, the Study points out.



As various interest groups battle over the use of farmland, many farmers may see the agricultural use of land as impermanent, reports the National Agricultural Lands Study. Because of this "impermanence syndrome" some farmers may not be willing to invest in conservation practices.

Cost-Sharing . . .

Reaching The Problem Can Be A Problem

Conservation cost-share money is not being used to improve land that needs it most, reports the National Summary Evaluation of the Agricultural Conservation Program (ACP).

ACP is the federal cost-share soil conservation program administered by the USDA's Agricultural Stabilization and Conservation Service. Illinois farmers participating in ACP can be reimbursed for as much as 80 percent of the cost of instituting conservation practices.

But according to the national evaluation, 52 percent of the ACP cost-share payments in the United States go

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for projects on land that accounts for only 2 percent of the excess erosion. Meanwhile, 21 percent of the payments go for projects on land that accounts for 82 percent of the excess erosion.

Soil erosion is considered "excess" when it is greater than the soil loss tolerance level, also known as the "T level," says Robert Walker, University of Illinois Extension natural resources specialist.

When soil erosion exceeds the T level, soil is eroding faster than it can be replenished by nature. Depending on soil type, Walker says the T level for most Illinois cropland soils ranges from 3 to 5 tons of soil erosion per acre per year.

The land which accounts for 82 percent of the excess erosion — but receives only 21 percent of the payments — is land with soil loss exceeding 14 tons per acre per year.

Reaching farmers who have highly erosive land will require an aggressive education effort, says Frank Schoone, ACP specialist in Illinois. "Because ACP is a voluntary program, farmers who have erosion problems must be educated," he says. "There's a lot of farmers out there who don't know they've got a soil erosion problem."

The national evaluation of ACP points out several reasons why most of the federal cost-share money goes to less erosive land. One reason is that even though there is excessive erosion on almost one-third of U.S. cropland, the majority of cropland does not suffer from excessive erosion.

Another reason for the misdirected money is that the county committees, which distribute the cost-share money, lack adequate information to know what land has the greatest need for soil erosion practices.

Also, because farmers choose the land on which to apply cost-shared conservation practices, they tend to apply them on land where the return in yields is maximized — usually gently sloping land rather than the most steep, erosive land.

Schoone points out that farmers with less erosive land usually are in a better economic position to participate in the cost-share program than are those with severe erosion problems.

"In Illinois, we keep a reserve for low-income farmers," he says. "But again, they need to be made aware of the need."

The national evaluation recommends that county committees be supplied with better information so they can put priorities on land that needs the most conservation treatment.

According to Schoone, county committees in Illinois have been directed to put high priority on encouraging conservation practices on land with soil loss of 10 tons per acre per year or more.

But even when you pinpoint the most erosive areas, you still have to convince the farmers who own that land to participate in the program, Walker says. "Some counties have found that to do this, there must be some knocking on doors," he says.

Time For A Revolution?

"It's time for a revolution of attitude on the part of all agriculturists, from the researchers to the farmers," says Mike Sager, University of Illinois Extension adviser in Woodford County. He is talking about a revolution of attitudes on soil erosion.

"Although many practice and teach soil conservation, some farmers, landowners and other agriculturists are no more interested in hearing of the need for erosion control than an alcoholic is interested in being encouraged to stop his habit," Sager says. "They grasp at every shred of information that suggests plowing is the thing to do so they can legitimize continuing poor practices on their erosive land."

But according to Sager, it's time for farmers with erosive land to overcome their plowaholic tendencies. "It's also time for agricultural specialists and advisers to recognize the serious consequences of soil erosion," he points out. "Agriculturists must give erosion control the same high billing given to profit and production."

Sager uses the problem of Trellan carryover as an example of how certain attitudes can stifle the acceptance of soil-saving practices such as conservation tillage.

Sager admits that Trellan carryover from soybean to corn ground occurs more on land with conservation tillage than it does on conventionally tilled land.

"But even though Trellan damage puts some stress on young corn plants, they tend to outgrow it with no serious reduction in corn yield," he points out. "The possibility of carryover affecting yields is only that — a possibility."

So Sager asks these questions: Why does the attitude persist that soybean stubble land should be plowed to avoid the possibility of Trellan carryover damage? Won't the remedy for this potential problem — the moldboard plow — result in an even more serious consequence — soil erosion on erosive land?

"Why should we recommend plowing bean land to avoid a possible problem that seldom — if ever — results in serious consequences, while in the process we create a larger potential problem and cause our farmers to incur unnecessary expense in the process?" he asks. "It seems more logical to suggest that they leave the land untilled with the protective stubble-mulch cover for erosion control. And if they are really worried about Trellan carryover, they should be encouraged to switch to Lasso, Dual or some other suitable herbicide which poses no carryover problem."

Sager says not all herbicide questions have such simple solutions, but he adds that this example still reveals the lackadaisical attitude that some people give to soil erosion.

"In view of the excess erosion on 40 percent of our Illinois cropland, and in view of the growing pressure that will be placed upon that land in the foreseeable future to meet world food demands," he continues, "is it unreasonable to suggest that we take this serious problem into account?"

will be reduced after each tillage operation, as well as during decomposition over the winter. Using figures in Table 2, you can estimate what management practices will leave the desired amount of residue. But the actual amount of residue reduced by tillage will be influenced by several factors, Walker says, including the size of the equipment used and the speed and depth at which the equipment is operated.

Table 2. Residue Reduction From Tillage Operations

Tillage Operation	Percent of Crop Residue Remaining After Tillage	Percent Reduction of Crop Residue After Tillage
No-Till Planting	90-100	0- 10
Chisel Plow Straight Shanks	75- 80	20- 25
Chisel Plow Twisted Shanks	40- 50	50- 60
Field Cultivator (with sweeps)	75- 80	20- 25
Tandem Disk after harvest before other tillage	85- 90	10- 15
Tandem Disk after previous tillage	40- 60	40- 60
Offset Disk (24-inch blades, 6 inches deep)	25- 50	50- 75
Moldboard Plow	0- 5	95-100
Overwinter Decomposition	70- 75	25- 30

Assume you have a 125-bushel-per-acre corn crop. By looking at Table 1, you find that one bushel of corn will produce 56 pounds of residue. Multiply 125 by 56 and you find that there will be 7,000 pounds of residue at harvest.

Then, suppose you plan to disk the stalks with a tandem disk before any other tillage. By looking at Table 2, you find that after this process, 90 percent of the residue will remain. If you multiply .90 by 7,000 pounds, the result is 6,300 pounds of residue.

Next, suppose you plan to use a chisel plow with straight shanks. Again, consult Table 2 and multiply the 6,300 pounds of remaining residue by .75. The result is 4,725 pounds left on the soil surface.

Finally, you must take into account decomposition over the winter, Walker explains, so multiply the 4,725 by .70 and you find that 3,300 pounds will remain in the spring. If the field will be field cultivated in the spring, multiply the 3,300 pounds of residue by .75 and you come up with 2,480 pounds of remaining residue.

The whole process, in short, is:

- $125 \times 56 = 7,000$ pounds of residue at harvest.
- $7,000 \times .90 = 6,300$ pounds of residue after disking.
- $6,300 \times .75 = 4,725$ pounds of residue after chisel plowing.
- $4,725 \times .70 = 3,300$ pounds after winter decomposition.
- $3,300 \times .75 = 2,480$ pounds after cultivation.

"Keep in mind that this system will only give an estimate," Walker says. To verify your estimate, you must use the "point and line" method. The point and line method, which involves the use of a knotted rope

stretched across a selected field, measures the percentage of ground covered by residue. (See the Winter, 1980-81 issue of *208 Update*.)

Also, to find out how much residue is needed to adequately control erosion on your land, Walker recommends using the Universal Soil Loss Equation. The equation takes into consideration several factors—including rainfall, slope of land and management practices—to tell you the amount of soil erosion on a particular piece of land. By interchanging management practices in the equation, you can find out the impact of different amounts of residue on erosion.

For more information on the point and line method and the Universal Soil Loss Equation, contact your local Soil and Water Conservation District or Cooperative Extension Service office.

Experiment Examines 'Recycled' Sediment

University of Illinois researchers are attempting to find out if the "paradise" can be put back into Lake Paradise and whether yields on nearby farmland can be improved at the same time.

Beginning in spring, 1981, researchers will extract sediment from Lake Paradise and spread it on test plots, says Walt Lembke, U of I agricultural engineer. Then they will plant corn and soybeans on the plots to find out if yields improve. In a sense, they will be recycling soil that has eroded into the lake.

The project is significant, Lembke says, because one of the problems with removing sediment through dredging is the question of what to do with the sediment. He points out that applying sediment on farmland has been used at several lake sites in Illinois, but the fertility of the sediment has never been studied.

Lake Paradise, located three miles southwest of Mattoon in central Illinois, is now classified as a "dead lake" because it no longer serves its original purpose as a water supply for Mattoon. Lembke says sedimentation also has destroyed its recreational value.

An estimated 10,000 tons of sediment washes into Lake Paradise every year, he says. This is roughly equal to 5 acres of sediment, one foot deep. When the lake was built in the early 1900s, it had a surface area of 160 acres, but that has been reduced to 120 acres.

According to Lembke, long-time residents in the area tell how they can now walk across areas where water was once deep enough to dive into.

There is a good chance that growing crops on the sediment will improve yields, he continues. Chemical analysis by Joe Fehrenbacher, U of I agronomist, indicates that Lake Paradise sediment is in better shape than the soil still left on the surrounding land.

"The sediments are generally high in plant nutrients such as phosphorus, potassium and calcium and about medium in organic matter and nitrogen," Lembke says. "They also are neutral to slightly alkaline and would not require liming for good crop growth. In addition,

Nitrate Controversy Is At Crossroads

The controversy over nitrates in Illinois' water is at a critical point, says Sam Aldrich, retired assistant director of the University of Illinois Agricultural Experiment Station.

He says that the trend in nitrate concentrations is less threatening than it was eight to 10 years ago. But because nitrogen fertilizer has recently re-entered a period of growth, nitrate concentrations in water today bear watching.

"Nitrate concentrations in water should be watched closely to see whether factors are operating that have somewhat stabilized the nitrate levels in surface waters or whether the most recent eight to 10 years are only a temporary pause in an upward trend," he says.

The major health hazard posed by excessive nitrates in water is methemoglobinemia in babies, Aldrich says. Methemoglobinemia is when the oxygen-carrying capacity of the blood is reduced. "But even though nitrogen fertilizer use has risen dramatically and farming has intensified," he points out, "the last reported infant death in the United States resulting from high nitrate concentration in water was in 1949."

Nitrates also have been linked with cancer in rat test animals, but controversy surrounds the reliability of this report.

According to U.S. Geological Survey data on four east-central Illinois rivers, in 1906-07 the average concentration of nitrate nitrogen per liter of water was 2.5 milligrams (mg.). Seventy years later, the nitrate concentration in these rivers had increased 60 percent to 6 mg. per liter. The current suggested limit for public drinking water, set by the United States Public Health Service, is 10 mg. per liter.

This increase helped bring the nitrate controversy into the public eye when the environmental movement got rolling in the late 1960s and early 1970s, Aldrich notes.

Some of the agriculturally related reasons for the increase in nitrate concentrations in Illinois streams were the removal of native vegetation to make room for more intensive farming, an increase in livestock numbers and consequently, more nitrates from waste runoff, and the increase in use of nitrogen fertilizer.

The increasing use of nitrogen was temporarily interrupted from 1960 to 1974, he continues, but the upward trend was re-established in 1975. Though the impact of this renewed increase in the use of nitrogen fertilizer is not yet known, Aldrich projects that nitrate concentrations in water will continue to level off and not surge upward once again.

In his new book, *Nitrogen In Relation To Food, Environment, and Energy*, Aldrich gives the following reasons for his projections:

- Nitrate concentrations appear to have leveled off in most Illinois rivers.
- The amount of nitrogen released annually from soil humus has slowed substantially and will approach

zero at some future date.

- The increase in acreage of row crops has about run its course.
- The acreage of new tile drainage systems has nearly leveled off (tile drainage is one route for nitrates to reach water supplies).
- The total acreage of nitrogen-fixing legumes has nearly reached its peak.
- Crop yields have been continuing to increase and, consequently, larger amounts of nitrogen are being extracted from the soil.
- Even though the population served by sewers will increase, nitrogen in discharge waters from municipal sewage treatment plants probably will be reduced in the future by new treatments or alternatives to direct discharges into streams.
- Although livestock numbers will probably increase somewhat, waste runoff into surface waters should be reduced by new regulations that require runoff control.

Put Planning Into Residue Management

"Crop residue management involves a three-pronged plan," says Robert Walker, University of Illinois Extension natural resources specialist.

It involves figuring out the amount of crop residue you must leave on the ground to adequately control soil erosion; deciding what management practices will produce that amount of residue; and then verifying whether the practices worked.

The middle step—deciding on your management practices—depends on the crop you are growing. You can estimate how much residue is produced by different crops by referring to Table 1.

Table 1. Approximate Amount of Residue Produced by Crops

Corn or Sorghum	1 bushel of grain	56 lbs. of residue
Wheat or Rye	1 bushel of grain	100 lbs. of residue
Oats	2 bushels of grain	100 lbs. of residue
Soybeans	1 bushel of grain	45 lbs. of residue

Walker points out that these figures are reasonable estimates. But because of differences in weather conditions or crop varieties, the actual amount of residue produced on your land may vary. Residue produced by soybeans is extremely variable, depending on the variety, he says. For instance, long maturity varieties used in the South may produce 90 pounds of residue per bushel, while some dwarf varieties will produce 40 pounds.

Soybean leaves decay rapidly and tillage operation buries a higher percentage of this type of residue, according to Walker. He says the 45 pound figure is a conservative average figure.

The amount of crop residue left on the soil surface



To break through the moldboard mindset, certain farmers and agricultural specialists must be willing to steer from tradition, says Mike Sager, Woodford County Extension adviser. The moldboard plow (above) buries crop residue and gives the field a clean appearance. But a clean field is often on erosive fields. The chisel plow (left), which is gaining more acceptance in Illinois, leaves a protective cover of crop residue on the field. According to Robert Wolker, University of Illinois Extension natural resources specialist, the chisel plow with straight shanks leaves 75 to 80 percent of the crop residue on the soil surface after tillage. The moldboard plow leaves only 0 to 5 percent.

To break through the moldboard mindset, certain farmers and agricultural specialists must be willing to steer away from tradition and try new methods such as conservation tillage, Sager says. "During the past decade, thousands of Illinois farmers have demonstrated that the system works," he points out.

The "demonstration" method of encouraging conservation tillage has worked in Woodford County, where 75 percent of the farmers now use some form of conservation tillage.

Sager reminds the agricultural community that at one time, anhydrous ammonia was not well accepted as a source of nitrogen for corn because of fears that it could "burn" the crop. But he says the real reason for the slow acceptance of anhydrous ammonia was that it didn't fit into Illinois' tradition of using crop rotation to maintain soil fertility.

"In the same way, is tradition standing in the way of conservation practices?" he asks.

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these are relatively unpolluted sediments."

But Lembke says one potential problem may be a loss of available phosphorus when the sediment is exposed to air. And another potential problem is the length of time it will take to "dewater" the sediment.

Sediment will be removed with a hydraulic dredge and pumped behind terraces where water will be drained from the soil. Lembke hopes that this dewatering process will only put the land out of production for one year or less.

If the dewatering process does not put the land out of production for more than one year and if yields actually do increase, then Lembke believes the system could become a practical way to reclaim lakes. Significant yield increases should interest farmers, he says, as long as the public is partially responsible for pumping out the sediment.

Another goal of the Lake Paradise project is preventing soil from washing into the lake in the first place. "But presently we don't have the finances to address this aspect," Lembke says.

The U of I is conducting the study in cooperation with Lake Land College, the Illinois Department of Agriculture and Dodson Van Wie Engineers, Ltd. Preliminary results will be back in late 1981, Lembke says.

Notes

New Book Examines Nitrogen And Environment

Nitrates in water, health and environmental effects of nitrates, organic farming and the role of nitrogen in food production are just some of the topics handled in Sam Aldrich's new book, *Nitrogen In Relation To Food, Environment, and Energy*.

Aldrich is a retired assistant director of the University of Illinois Agricultural Experiment Station. For

information on cost and how to order the book, write: Office of Agriculture Publications, 123 Mumford Hall, 1301 W. Gregory Drive, Urbana, IL 61801, or call 217/333-2007.

Electrified Manure

"Plug in the manure pit." That sounds like a strange order. But in the future, livestock producers may do just that to make good use of liquid waste.

University of Illinois researchers are finding that electrifying liquid wastes can produce protein for livestock feed and hydrogen for fuel — while eliminating odor.

"The process presents real possibilities for helping livestock producers meet pollution control standards," notes Don Day, U of I agricultural engineer who helped develop the study.

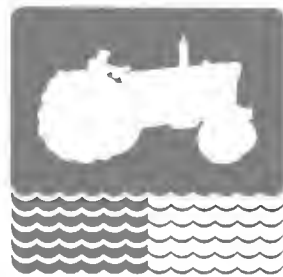
Robert D. Walker
Extension specialist
Natural Resources

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"208" Update for Agriculture

AGRICULTURAL ISSUES RELATING TO STATEWIDE WATER QUALITY PLANNING



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Summer, 1981

208 Lives On, With Or Without Federal Funding

"As I understand, federal funding for 208 water quality management planning for fiscal year 1982 is zero," says Bob Clarke, the 208 project manager.

Does that mean the death of 208? Not so, Clarke says. He points out that the 208 Water Quality Management Plan in Illinois has done its job of laying the foundation for dealing with water pollution. The planning process was essentially completed in 1979 and the 208 plan is now in the implementation stage, he says.

"The Illinois Environmental Protection Agency's role now is to integrate water quality programs into the proper agencies," Clarke says. In other words, the goals of the 208 plan are being absorbed into existing programs.

For example, the 208 plan's soil erosion program is being carried out by the Illinois Department of Agriculture. The Department of Agriculture has outlined soil erosion control goals, which include the long-term goal of reducing erosion on all farmland to 2 to 5 tons per acre per year by the year 2000. The Department also is administering the state's first conservation tillage cost-share program.

But just because the 208 objectives are being carried out through such programs—with other sources of funding than the 208 allocation—that doesn't mean funding is secure.

With the prevailing "slash the budget" atmosphere, the Department of Agriculture may find it difficult to expand its conservation cost-share program, says Gary Wood, section chief for the Department's Division of Natural Resources. The Department of Agriculture had hoped to double the cost-share budget in 1982 with an



Erosion devours a bank along Carlyle Lake, which is roughly 50 miles east of St. Louis.

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additional \$500,000, Wood says. But as he puts it, "only time will tell" whether the cost-share budget will see any increase at all.

The Illinois Lakes Program, another descendant of the 208 plan, also faces a large financial question mark. Federal funds for new clean lakes projects in fiscal year 1982 have been eliminated, so Illinois EPA will have to rely on alternative sources of money in the future, says Donna Sefton, coordinator of the Lakes Program (see accompanying article).

But regardless of what happens in these scrambles for funding, Clarke says the 208 plan has left its mark in many ways and in many programs.

In 1976, no lake in the state, other than Lake Michigan, was being monitored by the Illinois EPA for water quality, he says. But since the Lakes Program began in 1977, the Illinois EPA has surveyed the physical characteristics, use and problems for 353 Illinois lakes; has monitored a minimum of 15 lakes per year; has organized a system to set priorities on what lakes need the most rehabilitation; has started a volunteer lake monitoring program; and has done intensive research on the effects of erosion control strategies on specific lakes.

Clarke says the 208 plan not only sparked projects such as the Lakes Program and the conservation cost-share program, but it alerted the general public to the problem of nonpoint sources of pollution.

In the past, he says, the major emphasis was on the more easily identified "point" sources of pollution—sources such as the waste discharge from certain industrial plants.

But according to Clarke, "The 208 plan brought attention to all forms of water pollution, including nonpoint sources—urban runoff, sewage treatment, mining wastes, sanitary landfills, pesticides, livestock wastes, fertilizers and soil erosion."

Volunteers Plumb The Depths

Henry David Thoreau, of Walden Pond fame, once said, "A lake is a landscape's most beautiful expressive feature; it is earth's eye onlooking into which the beholder measures the depth of his own nature."

This year, volunteers are venturing onto lakes throughout Illinois to do some measuring, but not necessarily to measure the depths of their own natures. They are measuring the depth that light penetrates water.

The program kicked off this May when Illinois EPA officials began training volunteers to test the water quality of 100 lakes across the state. Michigan, Minnesota and Maine have run similar programs with considerable success, Sefton says, and so far, the response in Illinois has been good. She says that over 200 volunteers showed interest in the program, but the Illinois EPA only had resources to train 100.

Illinois EPA officials are training volunteers to measure the clarity of lake water, using a weighted, black-and-white "Secchi disc." These measurements will be taken at three spots on each lake twice per month from May to October.

Volunteers lower the Secchi disc into the water until it vanishes from sight. Then they note the depth at which the disc disappeared. As they pull the disc back up, they note the depth at which the Secchi disc returns into view. An average of the two depth readings is calculated.

According to Sefton, the measurement indicates how deep the light penetrates into the water. "Generally, two to five times the Secchi disc depth readings equals the 'euphotic,' or lighted zone, of the water," she says. "The euphotic zone is the region of the lake where there is enough oxygen to support fish and other aquatic life."

Sediment suspended in the water and excessive plant life—two of the major problems in Illinois lakes—reduce the euphotic zone, Sefton says.

Volunteers also will make field observations of lake characteristics such as water color, algae, weeds and amount of suspended sediment. Illinois EPA officials will then examine all of the information and prepare reports on each lake.

These reports will be sent to the volunteers who may utilize the information in their area. The EPA will be ready to provide technical assistance to groups or communities that plan to take the next step of cleaning their lakes.

Not only will the volunteer program generate water quality data, but in the process, citizens will become more involved with their lakes, Sefton says.

The volunteer effort is one piece to a broader Illinois Lakes Program which was initiated in 1977 under the 208 Water Quality Management Plan, she continues.

The Lakes Program began with a survey of the physical characteristics, uses and problems on 353 Illinois lakes; and then in 1979, the Illinois EPA sampled the water quality of 63 lakes. The agency now samples at least 15 lakes annually.

Through funding from the Section 314 federal Clean Lakes Program, the Illinois EPA is currently conducting four lake restoration projects in the state and is developing a system to set priorities on what lakes need the most help. The system is being coordinated with the priorities set by the U.S. Department of Agriculture.

But Sefton says that funding for new projects under the Section 314 program has been eliminated from the Reagan administration's fiscal year 1982 budget. "However, we intend to maintain the Lakes Program by integrating our projects into existing programs," Sefton says.

For more information on the Illinois Lakes Program, contact: Donna Sefton, Lakes Program Coordinator, Planning Section, Division of Water Pollution Control, Illinois EPA, 2200 Churchill Road, Springfield, IL 62706 or call at 217/782-3362.



This swine operation in Kinmundy, Ill., is the scene of experiments on the use of Chinese carp for cleaning water that has been contaminated by wastes.

mon carp to the United States in the 1800s was a mistake, Allen says, because the carp muddied the waters and competed with gamefish for the same food. "We don't want the proliferation of other carps to cause the same problems," he says.

In order for Chinese carp to become legal for use in waste management systems, a sufficient public demand would be necessary, Allen continues. Then, more research would have to be done on the carp's effect on the environment. Also, because the Chinese carp would be raised on organic wastes, the Department of Public Health would probably want to find out whether the fish would be a safe source of food, Allen adds.

"Making Chinese carp legal is a possibility," he says. "But more research is needed."

Recreation Is More Than An 'Extra'

Recreation deserves more attention than it usually receives in most lake cleanup projects, says James Absher, assistant professor of leisure studies at the University of Illinois.

"Recreation should be built in on the ground floor of these projects, rather than just pulled off the shelf later," he says, encouraging planners to make recreation part of the initial planning process and not just an "extra" thrown in at the last minute.

After all, he notes, when communities weigh the costs and benefits of lake restoration projects, recreation usually makes up a major portion of those "benefits."

A study conducted for the University of Illinois Water Resources Center looked at the economic benefits of reclaiming Lake Paradise, just outside Mattoon. In the study, dollar figures were assigned for costs and benefits; and one of the biggest economic benefits came from projected recreation revenue — \$25,000 to \$50,000.

Absher and a graduate assistant, Douglas Musser, also conducted a study on Lake Paradise for the Water

Resources Center and they found that putting more emphasis on recreational needs can help avoid some costly blunders.

For example, Absher and Musser's survey of residents near Lake Paradise revealed strong support for using part of the lake for a nature study area. More than half of those surveyed thought the public school system was not doing a good job of educating the youth about the environment and 90 percent said they favored the establishment of the nature study area.

Without this knowledge, the entire lake might have been dredged to accommodate recreational activities such as power boating. But if the public is to get a nature center, some of the lake must be left in a marshy condition.

The survey shows that while the nature study area, hiking and picnicking were at the top of the list of recreational interests at Lake Paradise, power boating was at the bottom of the list. Absher says residents indicated that they went to larger reservoirs, such as Lake Mattoon and Lake Shelbyville, for power boating.

Absher cites yet another example of how proper planning can eliminate recreational mistakes. From the beginning of the project, planners for Lake Paradise Regional Renewal, Inc., hoped to build a golf course.

But, according to Absher, "The survey indicated that of the possible recreational activities suitable for the Lake Paradise area, golf rates relatively low."

Absher and Musser's study also showed that most area residents were generally unaware of the extent of the water quality and quantity problems at Lake Paradise. Meanwhile, the majority of respondents recognized that recreational opportunities in the area were not up to par.

"As long as water keeps coming out of the tap," Absher says, "the public generally does not recognize impending water quality and quantity needs. Recreational needs,

such as the conservation districts and county committees."

He also says that local groups -- not the federal government -- would decide how fast the practices would be put into use to keep farmers from being burdened heavily in any one year.

"The destruction of soil resources in agriculture proceeds from a belief that more production means more income, which then means more money invested in conservation," Barlow says. "But more production can mean lower commodity prices and therefore *less* conservation. Even more production at higher price levels does not mean more conservation if recipients decide to shift that money to other uses."

Presently, "the people who get hurt are those who do right by their land," Barlow adds. He says that farmers who reach high levels of production by abusing the soil pull down market price indexes. Then, when the economic squeeze is on, the first farmers to be hurt are those who have taken on the extra cost of conservation practices.

"Through federal assistance, the government is helping farmers produce," Barlow says. "Should the government subsidize a farmer who is destroying his land and penalize conservation-minded farmers through the marketplace?"

But Scholl says that with cross-compliance, there's the danger that government will tell farmers to put conservation practices into use without providing enough financial assistance for them to do it.

There are better alternatives than cross-compliance, according to Scholl. He says he would rather see more money and effort put toward positive incentives such as tax breaks and cost-sharing, rather than negative incentives.

Also, conservation cost-sharing programs should be more aggressive in making sure money gets to the land that needs the most help, he says, and education efforts should be bolstered.

According to Scholl, "Once farmers understand that they have an erosion problem, they are more than willing to do something about it."

Barlow's response is that "We're not saying cross-compliance is the only answer to the erosion problem."

He agrees that education, tax incentives and cost-sharing are needed. "But simply making these available doesn't mean that conservation will be practiced on the land," Barlow notes. "Abuse can still occur in significant measures. According to USDA statistics, we are only meeting 20 percent of the erosion needs on America's farms."

Fish Show Potential For Waste Management

An ancient practice shows potential as a natural solution to the problem of purifying water, says Homer Buck of the Illinois Natural History Survey.

The "natural solution" may be Chinese carp, a group

of exotic fish that feeds on all available organic matter in the water in which they swim.

According to Buck, "The concept of utilizing fish to purify wastewaters had its origin in ancient Chinese aquaculture. For centuries, the Chinese farmer has placed his latrine over the fish pond, his pigsty and chicken coops on the pond bank, his ducks and geese on the pond surface."

He says that Chinese carp feed on the wastes from these sources and, in turn, the fish are harvested as food.

Buck and other researchers in Kimmunity, Ill., have been experimenting with the use of Chinese carp for cleaning water that has been contaminated by wastes from swine operations. And he says that, so far, results have been promising. The researchers have found that even as the pigs grew in size and more manure flowed into the pond, the carp still managed to reduce the biological oxygen demand (BOD).

When the BOD is lowered, that essentially means organic wastes are being removed from the water. "It means the water is being treated," Buck says. "It's the same as in a sewage plant."

Not only do the Chinese carp efficiently remove wastes, Buck says, but they also are a good source of protein.

"You could produce 2 tons of Chinese carp per acre (of pond) without any food input except manure," Buck says, "so the carp are an inexpensive form of protein in contrast to other fish grown with expensive food."

Presently, the use of carp would not make a practical farm waste management system unless the farmer also planned to market the fish, Buck says. It would take a 2½-acre pond stocked with carp to handle the wastes from 50 to 60 pigs. He says most farmers would not be interested in using their land for a pond that size unless they planned on marketing the fish.

However, Buck says the carp would be quite practical for handling domestic wastes in small communities. "Many cities in Europe use the carp now," he notes.

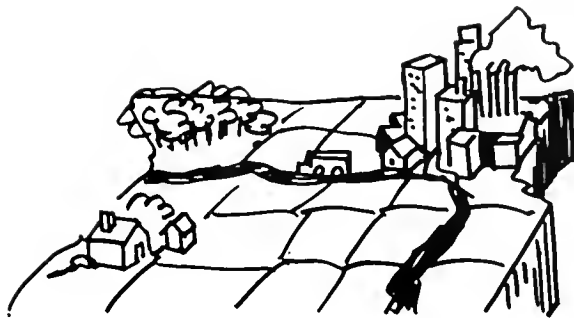
For example, in Munich, West Germany, carp have been used for secondary treatment of wastes since 1929.

"Also, in a study in Benton, Ark., Chinese carp were used to treat sewage from a state hospital—which is just like a small community," Buck says. "They had such good results that the Environmental Protection Agency wants to set up demonstration systems in various small communities."

There is one major obstacle to using Chinese carp for waste management purposes in Illinois. Because they are an exotic fish, they cannot be legally used in this and most other states except for research purposes.

James Allen, administrative assistant for the Illinois Division of Fish and Wildlife Resources, says scientists don't know how Chinese carp would affect the ecosystem.

Some people believe that the introduction of the com-



How can we best ensure the wise use of land resources?



Should Conservation Practices Be Required For USDA Aid?

The Natural Resources Defense Council supports the idea, the Farm Bureau is against it and a recent survey shows that most farmers in 10 states agree with the concept.

The subject of this controversy is cross-compliance, a system in which farmers would be required to meet soil conservation standards in order to qualify for price and income support.

According to a survey by the University of Illinois and nine other land-grant universities, more farmers in those 10 states agree than disagree with the cross-compliance system.

The survey was taken in Illinois, Indiana, Michigan, Minnesota, North Dakota, Ohio, Oregon, Washington and Texas immediately after the 1980 election and in Nebraska in early January.

Thirty-eight percent of the Illinois farmers surveyed said they agreed with the proposal to "require each farmer to follow soil conservation measures to qualify for price and income support." An additional 14 percent said they strongly agreed, while 21 percent disagreed, 14 percent strongly disagreed, 8 percent had no opinion and 5 percent didn't answer.

Cross-compliance is one of the soil conservation strategies being considered by the U.S. Department of Agriculture; but it faces opposition from formidable

opponents, such as Farm Bureau.

"Different federal programs are implemented for different reasons, usually to help farmers with circumstances out of their control," says Jon Scholl, director of natural and environmental resources for the Illinois Farm Bureau. "By requiring farmers to meet one program in order to qualify for another, you could hit some farmers really hard."

Scholl questions whether a cross-compliance program could be administered without a mountain of red tape. He also says such a program would be snagged with a variety of problems.

"For example," Scholl says, "what if a farmer has three landlords and only one landlord complies with soil erosion standards? Does the farmer qualify for other federal programs or not?"

Tom Barlow, senior associate with the Natural Resources Defense Council, says he expects "a lot of questions like that. But such situations shouldn't torpedo the value of cross-compliance."

These questions will have to be dealt with, he says, just as any new program must iron out problem areas. But the questions shouldn't be used to side-step the main issue of cross-compliance, he says.

"The cross-compliance concept has been attacked as federal intervention in a farmer's business," Barlow continues. "But we point out that the required conservation practices, which farmers will have to apply to the land, should be decided by local farm organizations

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on the other hand, may be more visible. If planners gave more attention to recreation, they probably could gain more community support for the lake projects as a whole. And public involvement in recreational planning would provide an opportunity to better educate people on the water quality and quantity problems."

As the study seemed to indicate, "there surely is need for an intensified education effort," Absher says. About 60 percent of those surveyed said they thought Lake Paradise water quality *had not* decreased in the past 10 years. This misconception was just the opposite of what water quality experts reported.

Notes

Untillage?

In Jones County, Iowa, farmers have created an "Untillage Committee," with an "Untill pledge" which goes like this:

"I will till no soil Until its time.

"If I don't have a darned good reason for fall tillage, I will wait Until spring.

"If it's planting time and I still don't have a good reason, I will try no till."

According to the committee, tillage in moderation is acceptable but too many farmers don't know when to quit. The Untillage committee pinpointed some of the common phrases that lead to excessive tillage.

1. I would love to have a big tractor like . . .
2. That black field sure is pretty . . .
3. All the neighbors are out . . .
4. I would rather be on the tractor than doing this . . .
5. It's such a nice day, I think I'll make a few rounds . . .
6. The neighbors will think I'm lazy if I don't . . .
7. Just one more pass to smooth up the . . .
8. If I don't bury the trash, it will plug the . . .
9. Fall fertilizer has to be incorporated . . .

New Organization's Aim Is Lake Protection

If you're interested in the protection, restoration and management of lakes, you also may be interested to know that the North American Lakes Management Society was chartered on September 10, 1980, in Portland, Maine.

Membership in the Society is open to any individual or organization interested in lake management. This may include scientists, planners, engineers, lakeshore property owners, consulting firms, governmental agencies and concerned citizens in the United States, Canada and Mexico.

For individuals, membership is \$15 per year; for families and public non-profit organizations, it's \$25 per year, and for corporations, it's \$50 per year.

For more information, write to: North American Lake Management Society, Post Office Box 68, East Winthrop, Maine 04343.

Robert D. Walker

Robert D. Walker
Extension specialist
Natural Resources

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